



AEROFLOT PLOT
WHAT IS DRIVING
RUSSIAN ICON TO
BUY TRANSAERO?
NEWS FOCUS P23

NEO REALITY

Airbus cuts first metal for re-engined A330 and sets out ambitions for Chinese completions facility **13**

DECISION TIME

With Long-Range Strike Bomber choice overdue, US Air Force looks to hit performance targets **20**

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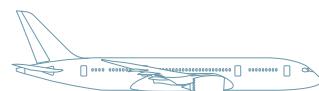
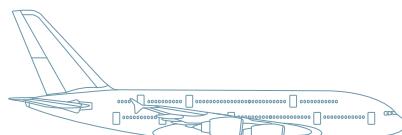
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**COVER IMAGE**

This striking composition by UK artist Gary Redford accompanies our annual review of the Top 100 aerospace companies, produced with PwC **P26**

**BEHIND THE HEADLINES**

Craig Hoyle paid a visit to the Italian air force's **Galatina air base** near Lecce, where he received an update on **Alenia Aermacchi's** plans for the **M-346** advanced jet trainer, and the company's work to develop the smaller **M-345** for the same service (**P11**)

**NEXT WEEK EMBRAER E2**

We look at the production status of Embraer's E-Jet E2, and visit Gulfstream as G550 scans for US Air Force deal

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Platon-AirImagines

PC-21 for Australian trainer need P19. Transaero and prospective new owner Aeroflot set arduous journey **P23**



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IMAGE OF THE WEEK

Weapons testing work with the US Navy's carrier variant of the Lockheed Martin Lightning II is progressing at its NAS Patuxent River site in Maryland. F-35C test aircraft CF-2 is shown carrying four GBU-12 precision-guided bombs and a pair of Raytheon AIM-9X Sidewinder air-to-air missiles under the wing

View more great aviation shots online and in our weekly tablet edition:



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Lockheed Martin

THE WEEK IN NUMBERS

7.2%

Flightglobal dashboard

Share of the installed fleet in 2015 deliveries, rising to 8% in 2016; overcapacity looms, warns Flightglobal Ascend

\$260m

Orbital ATK

The US Navy has contracted Orbital ATK to supply it, plus the Australian and Italian air forces, with AARGM missiles

500

Lockheed Martin

Approximate number of jobs that will be cut at Lockheed Martin's IS&GS information systems unit by mid-November

QUESTION OF THE WEEK

Last week, we asked: **Comac's ARJ21 service entry in 2016?**
You said:

74%

Type will struggle commercially

18%

Irrelevant:
C919 is real deal

**TOTAL
VOTES:
505**

8%

Crucial for Chinese airline ambitions

This week, we ask: **Who should build the US Air Force's new bomber?**

- Boeing/Lockheed Martin team
 Northrop Grumman No-one – waste of money

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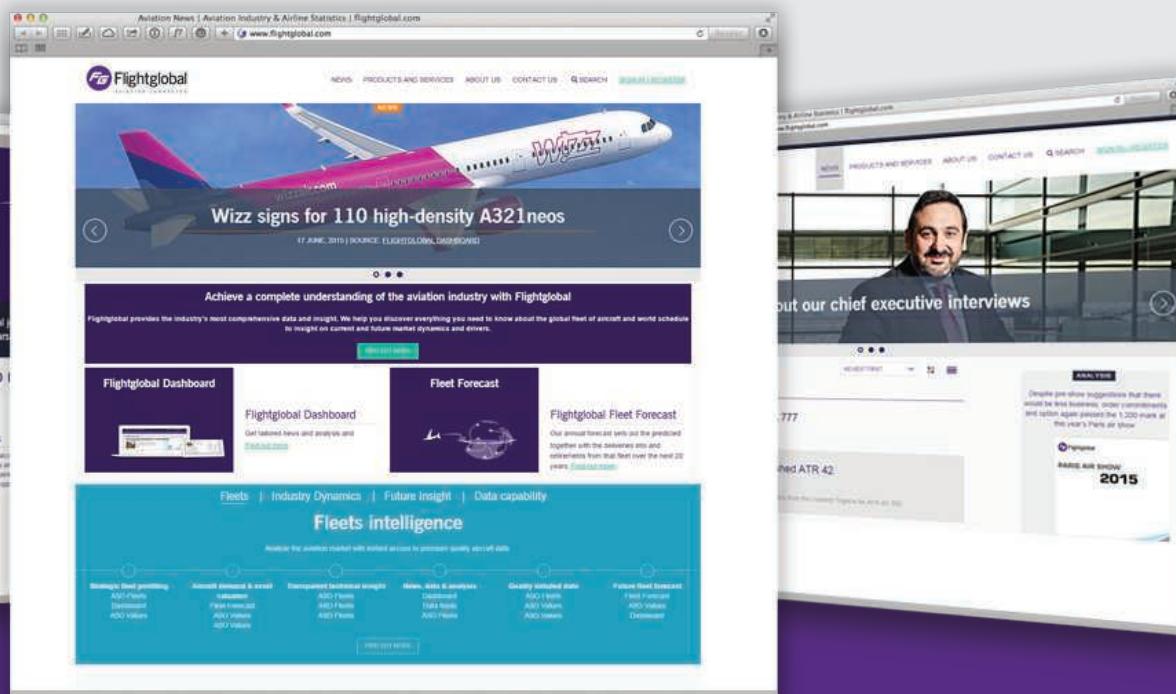


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Money machine

The aerospace industry has never had it so good – which is a good reason to be alert to global economic upheavals, which have the potential to disrupt a long-running cycle of strong growth

In this issue, we and our partners at PwC sift through 2014 aerospace industry financial data, indeed through a decade of such information. It is no surprise, but the numbers confirm the widely-held view that this industry has never had it so good.

For our Top 100 companies, it was another year of record revenues and strong profit growth, with civil aircraft sales more than making up for continued lean times in defence. This industry has outpaced world GDP for a decade, two years of the financial crisis aside.

The exceptional feature of the past decade – two, really – has been the transformation of much of what used to be called the Third World into sophisticated economies of increasingly wealthy consumers. People with increasing disposable incomes self-evidently want, increasingly, to travel. This shift in underlying conditions has decoupled aerospace from the normal economic cycle, putting the development, production and consumption of civil aircraft onto a super-cycle that looks set to roll on for another 20 years.

Critically, cheap money and dear fuel have supercharged the aerospace cycle

Aerospace is special for another reason. Unlike the car business – where supplying a growth market like China means heavy in-country investment in local production to account for local tastes and fast product cycles – with aircraft, there is no locational link between manufacture and consumption. Aerospace companies have thus been able to efficiently tap global capital and global talent to create a fluid global supply chain and glide over local economic ups and downs. But it is also


Nara Archive/Rex Shutterstock

Good times past

an industry which produces capital goods of large value and long lifespan. The decision to replace serviceable equipment which has been paid for is not taken lightly, but airlines have been eager to renew and expand their fleets; critically, cheap money and dear fuel have supercharged the aerospace cycle.

So, just as emerging market growth created the conditions for an aerospace super-cycle, rising interest rates and low oil prices could shut it off. Economies are fragile, consumer debt remains high and there is war in the Middle East and fear of war in East Asia, so do not be too surprised if this great aerospace money machine is shaken by a wobble on the pillar on which it stands.

That is, do not forget airlines. There are exceptions, but broadly, their history is that of a giant value destruction machine. No less a figure than Richard Branson, both star-struck with the allure of aviation and hard with business acumen, is credited with saying that the best way to become a millionaire is to start with a billion and buy an airline. ■

See Feature P26

Wheely bad behaviour

In the factual vacuum between a highly-publicised air crash or incident and the release of details from the investigation, secondary issues tend to dominate the public discussion.

Following the disappearance of Malaysia Airlines flight MH370 in March 2014, the industry was forced to confront the appalling lack of reliable flight tracking capability over oceans and remote areas.

But after the spectacular engine fire that engulfed a British Airways Boeing 777-200ER in Las Vegas, another safety issue has drawn attention, which may prove much more difficult – if not impossible – to address.

Pictures and videos shared by evacuating passengers revealed many of them plodding down the runway

with cumbersome carry-on luggage in tow. Retrieving such items during an emergency evacuation is clearly dangerous. If this does not kill passengers by slowing their exit, then large suitcases can cause major injuries on the exit slides.

How can this behaviour be stopped? Penalising scofflaws is likely to be a useless gesture. Passengers may be oblivious to the danger, or make irrational decisions. A Russian solution on the Irkut MC-21 is reported to use an automatic locking system for overhead bins. Until more is known about the cause of the 777 fire, it is worth turning the industry's focus to the carry-on luggage problem during an evacuation. ■

See This Week P12



To access our full listing of the Top 100 aerospace companies for 2014, go online at flightglobal.com/top100



BRIEFING

FURTHER HIKE FOR 767 PRODUCTION RATE

PROGRAMME Boeing will increase the production rate for the 767 by 25% – or six aircraft annually – starting in the fourth quarter of 2017. Its announcement comes less than two months after FedEx signed an order for 50 freighters, plus 50 options. A current monthly rate of 1.5 aircraft was already due to increase to two in the fourth quarter of next year, and will now rise further, to 2.5 per month. The US Air Force has also ordered four 767s with a unique commercial design for later modification into KC-46A tankers. The service will purchase up to 179 of the latter over the next 12 years.

BELUGA XL HEADS FOR THE TRENT

PROPULSION Airbus has picked Rolls-Royce Trent 700 engines to power its A330-derived Beluga XL specialised transporter under a \$700 million agreement, also including maintenance support. To replace its five A300-based Belugas, the XL is being aimed at service entry in 2019, to assist with the ramp-up of A350 production.

FIRST FLIGHT FOR ITALIAN-ASSEMBLED F-35

MILESTONE The Italian air force aims to make a first transatlantic crossing with the Lockheed Martin F-35 in early 2016, when a pair of jets will be flown from Novara to Arizona accompanied by one of its Boeing KC-767 tankers. Its lead conventional take-off and landing aircraft, AL-1, completed a 1h 22min debut flight on 7 September from a final assembly and check out facility at Cameri air base. A second Italian example is scheduled to fly during October.

USAF VETERAN FRETS OVER BOMBER PLAN

WARNING A fleet of not more than 100 Long-Range Strike Bombers will not be enough to meet US national security objectives, a former head of its air force's bomber command has cautioned. "Our capabilities are withering and we have less than 100 combat-ready bombers, with an average age of 38 years," Lt Gen Robert Elder told the House Armed Services Committee. "Eighty to 100 aircraft is not going to be enough to replace the [Boeing] B-1 and B-52 fleet, even though its capability against the target set will be greater."

See Defence P20

HONG KONG ENDS SEARCH WITH H175 ORDER

ROTORCRAFT Airbus Helicopters has secured a first order for the search and rescue variant of its 7.5t H175, with a seven-unit deal from Hong Kong's Government Flying Service. Three of the Pratt & Whitney Canada PT6-powered aircraft will be delivered from late 2017, with the remainder to arrive during the following year.

SWISS READY TO SIGN HERMES 900 DEAL

APPROVAL Switzerland's parliament has voted in favour of a deal to buy six Hermes 900 unmanned air vehicles from Elbit Systems, with a \$256 million contract to be signed within weeks. The Israeli firm has also secured a \$78 million award from another European nation to supply surveillance equipment for installation on the Hermes 900, including its advanced multi-sensor payload system.

JAKARTA SETS SIGHTS ON SU-35 BUY

FIGHTERS Indonesian defence minister Ryamizard Ryacudu has reiterated Jakarta's desire to order 16 Sukhoi Su-35 fighters, which would replace its air force fleet of six Northrop F-5Es. An acquisition, still contingent on government approval and sufficient funds, will take place "gradually", he told the Antara news agency.



LNP/Rex Shutterstock

Eleven people were killed when the aircraft crashed onto the A27

INVESTIGATION CRAIG HOYLE LONDON

'No defects' to jet in Shoreham crash

Preliminary AAIB bulletin says cameras in Hawker Hunter's cockpit show the aircraft was responding to pilot's inputs

The Hawker Hunter that was involved in a fatal air display accident in the UK on 22 August had no reported defects prior to taking off, and appears to have been performing as expected prior to the crash, the Air Accidents Investigation Branch (AAIB) says.

Releasing preliminary information about the accident in a Special Bulletin on 4 September, the AAIB says that information recovered from two cameras installed inside the vintage jet's cockpit indicate that "Throughout the flight, the aircraft appeared to be responding to the pilot's control inputs."

Eleven people were killed and the pilot seriously injured when privately-owned G-BXFI crashed onto a busy road next to Brighton City airport during the Shoreham air show.

An inspection of the 1955-built Hunter carried out at its home base at North Weald in Essex the previous afternoon showed "no reported defects".

The aircraft and its underwing external tanks were fully fuelled prior to a take-off run, which the AAIB notes was "longer than usual" – probably due to a high ambient temperature and a tail-wind of around 8kt (15km/h). Conditions at the time of the accident were record-

ed as a 12kt wind across the display airfield and an ambient temperature of 24°C, "with no significant cloud and visibility of more than 10km".

From a height of 200ft, the Hunter was "pitched up into a manoeuvre with both a vertical component and roll to the left, becoming almost fully inverted at the apex of the manoeuvre at a height of approximately 2,600ft," with an indicated airspeed of around 100kt, the bulletin says.

"During the descent the aircraft accelerated and the nose was raised, but the aircraft did not achieve level flight before it struck the westbound carriageway of the A27," the AAIB says.

"Ground marks and photographic evidence show that the aircraft struck the road in a nose-high attitude".

Following this, "fuel and fuel vapour from the fuel tanks was released and then ignited. The aircraft broke into four main pieces, which came to rest close together approximately 243m from the initial ground contact".

Although the jettisonable canopy was released during the first part of the impact, the inquiry has yet to determine whether the pilot attempted to eject or if it was dislodged as a result of crash damage, it says. ■



**Winds key focus
in BA blaze**
THIS WEEK P12

THIS WEEK

TRAINERS CRAIG HOYLE LECCE-GALATINA AIR BASE

Dual-role M-346 at final design stage

Configuration of proposed armed variant, which includes a 10% increase in engine power, is described as “almost frozen”

Alenia Aermacchi is close to finalising the design of an enhanced, dual-role version of its M-346, as the first batch of Italian student pilots prepare to fly the advanced jet trainer.

“There is a very important need in the market for a dual-role capability,” a company official says of the planned armed version. “We are talking to several potential customers.”

To highlight the twin-engined type’s potential in such a role, the company late last month displayed the trainer at the Radom air show in Poland carrying three-round launchers for MBDA’s Brimstone air-to-surface missile. The current model can be configured with seven hardpoints for weapons also including air-to-air missiles, or to carry sensors and external fuel tanks.

The new configuration is described as being “almost frozen”, and is expected to include a 10% increase in the power from the trainer’s Honeywell F124 engines, Alenia Aermacchi says.

Meanwhile, the company is waiting on a decision from the Italian government to add a further three aircraft to its existing commitment for the nationally-

designated T-346A trainer. Six have already been delivered to its air force, which is due to receive the next nine on-order examples starting in 2016.

A first course of students began their training leading to qualification on the T-346A at Lecce-Galatina air base in late August. The initial intake includes four Italian air force students and one instructor pilot from the service, plus an instructor pilot for the Royal Netherlands Air Force.

Alenia Aermacchi has already completed the delivery of 12 M-346s to Singapore, and has so far handed over 17 from an Israeli order for 30. It is also under contract to produce eight for Poland, but believes Warsaw could increase its order to at least 24 units, due to a need to replace its Sukhoi Su-22 ground-attack aircraft.

Further interest exists elsewhere in Europe, and from nations in Asia and the Middle East, the company says.

The Italian manufacturer also says it is “talking with a potential partner in the USA” in pursuit of that nation’s T-X trainer requirement. Its earlier pact with General Dynamics linked to a T-100 version of the M-346 dissolved. ■



Alenia Aermacchi

DEVELOPMENT

MB-339 replacement nears first flight

Italy’s M-345 trainer programme will be advanced next year with the first flight of a development example of the type equipped with a new Williams International FJ44-4M engine and modern avionics, Alenia Aermacchi says.

Scheduled to make its debut during the first half of the year, the aircraft is being adapted from the company’s previous demonstrator for the M-311.

Alenia Aermacchi has, meanwhile, already launched the production of its first new-build prototype of the M-345, with this featuring a new landing gear, redesigned nose section and replacement canopy.

To support certification activities, this should be flown for the first time during 2017.

Launched in June 2013 with the backing of the Italian air force, the M-345 is due to replace the service’s current MB-339s for pilot training – with deliveries expected from 2018 – and the type will also be used re-equip its Frecce Tricolori aerobatic display team.

The manufacturer says negotiations continue with the air force to determine the number of aircraft required, and that the design is also “generating a lot of interest around the world”. It also plans to offer a light-attack version from 2019. ■

APPOINTMENT STEPHEN TRIMBLE WASHINGTON DC

Procurement post for Lufthansa CSeries champion

Former Lufthansa executive Nico Buchholz has joined the swelling ranks of industry insiders on Bombardier’s top management team.

After being let go by Lufthansa as executive vice-president of fleet management in early September, the Canadian manufacturer has appointed Buchholz as head of procurement.

Buchholz had previously managed fleet acquisitions for Lufthansa, proving instrumental in the CSeries programme by signing the airline on as launch customer in 2008.

After Malmo Aviation withdrew its status as launch operator, Buchholz brokered a deal with Bombardier to make Swiss International Air Lines, a Luf-

thansa subsidiary, the new CSeries launch operator.

Buchholz joins a completely revamped Bombardier executive team. Former chief executive

Pierre Beaudoin agreed to step aside last January, allowing ex-United Technologies Aerospace Systems and Pratt & Whitney Canada executive Alain Bellemare to be appointed as the airframer’s new chief executive.

Bellemare also recruited two former airline and leasing operator veterans – Fred Cromer and Colin Bole – to head the company’s commercial aircraft division and commercial aircraft sales teams, respectively. ■

Additional reporting by Olivier Bonnassies and Laura Mueller in London



Bombardier

Swiss will receive its initial CS100 in the early part of 2016



COMBAT AIRCRAFT

STEPHEN TRIMBLE WASHINGTON DC

Waiting over for Saab as Brazil signs for Gripen

Brazil has finalised a \$4.68 billion deal for 36 Saab Gripen NG fighters, after more than 20 months of negotiations over pricing and industrial co-operation against the backdrop of a deepening economic and political crisis.

On 9 September, Saab announced the value of the contract is now booked in its order backlog.

"We will now work full speed ahead to ensure timely deliveries of Gripen NG to Brazil," says chief executive Håkan Buskhe.

Brazilian engineers and technicians will visit Sweden in October to begin training to assemble components and aircraft. Saab plans to deliver all 36 NGs between 2019 and 2024, with Embraer as its in-country partner.

The Brazilian government selected the NG in December 2013, after a contest also involving the Boeing F/A-18E/F Super Hornet and Dassault Rafale. Saab signed a contract in October 2014, but several key details had to be finalised before it could formally add the order to its backlog.

"The acquisition of Gripen NG will provide benefits beyond the enlargement of the Brazilian air force's [FAB] operational capacity. In addition to equipping FAB with one of the world's most modern fighters, the participation in the development of Gripen NG means a technological breakthrough for Brazilian industry," says Brazilian air force chief Lt Brig Nivaldo Luiz Rossato. ■



Barry Ambrose

Extensive damage was caused to the widebody's left-hand GE90 engine, leading edge, and fuselage

SAFETY DAVID KAMINSKI-MORROW LONDON

Winds key focus in BA blaze

NTSB likely to home in on the effects of meteorological conditions in Las Vegas 777 fire

US investigators are likely to examine the effects of apparent crosswinds when a British Airways Boeing 777-200ER caught fire and aborted take-off from Las Vegas.

All 157 passengers and 13 crew evacuated flight BA2276 as a blaze spread between the left-hand GE Aviation GE90 engine and the fuselage.

The aircraft suffered substantial damage to the powerplant, the

leading edge of the wing inboard of the engine and the left side of the centre wing-box area of the fuselage during the 8 September accident.

GE has not confirmed the engine failed during the departure to London Gatwick, although the US Federal Aviation Administration described the event as "engine fire".

However, the US National Transportation Safety Board

(NTSB) says initial examination of the engine reveals "multiple breaches" of the engine case in the area around the high pressure compressor (HPC).

In addition, it recovered several 7-8in (18-20cm)-long pieces of the HPC spool from the runway.

While the cause of the fire will be a focus of the inquiry, the NTSB is likely to pay close attention to the wind conditions.

The crew issued a mayday call at 16:13, shortly after starting the take-off roll from runway 07L.

McCarran airport issued a special meteorological broadcast 15min later which indicated an 8kt wind from 340°.

While the wind speed and direction has yet to be confirmed by the NTSB, the broadcast indicates a left-hand crosswind at the time of the fire, and the damage to the aircraft is consistent with a fire being fanned inboard from the engine to the fuselage. ■

British Airtours casts long shadow

The circumstances of the Las Vegas accident echo the engine fire suffered by a British Airtours Boeing 737-200 at Manchester in August 1985. This involved an aborted take-off after a left-hand engine failure. As the 737 slowed it halted with the fire upwind of the fuselage, fanning

the blaze towards passengers. Some 54 fatalities resulted, spurring safety recommendations including consideration of wind direction in a blaze. UK investigators pointed out that a slight wind, of even 2kt, could be "critically important" in terms of aircraft orientation in a fire.

CONTRACT

UK Police to acquire up to six P68Rs

Austria's Airborne Technologies has been awarded a contract from the UK National Police Air Service (NPAS) for the supply of up to six Vulcanair P68Rs, configured for airborne surveillance missions.

The deal for four role-equipped aircraft, plus options for two more, follows a successful six-month trial by NPAS with the Italian-built piston-twin. The aircraft has been providing country-wide air support alongside the service's helicopter fleet. However, the P68s will replace an equivalent number of rotorcraft when they enter service in 2016 and 2017.



Vulcanair



**Boards approve
Bohai's Avolon
addition**
AIR TRANSPORT P14

THIS WEEK

PROGRAMME DAVID KAMINSKI-MORROW LONDON

Initial production begins on A330neo

Re-engined twinjet starts to take shape with machining of engine pylons and manufacture of centre wing-box rib structures

Airbus has started cutting metal on the first re-engined A330neo, with initial production beginning on the aircraft's pylon and centre wing-box.

The airframer's Saint-Eloi site has commenced machining work on the titanium pylon that will carry the Rolls-Royce Trent 7000 engines.

Airbus says the pylon will incorporate design characteristics, including a new part-composite fairing, developed for the A350.

The company's facility at Nantes has started producing the rib structures for the A330neo's centre wing-box, it adds.

Two versions of the A330neo are being developed – the -800neo and -900neo – with deliveries intended to begin in the last quarter of 2017.



Titanium fixtures will carry the Rolls-Royce Trent 7000 engines

Airbus has secured orders for 145 A330neo jets. Ten of these orders are for the -800neo, with six for Hawaiian Airlines and four for TransAsia Airways.

Air Lease, Avolon and CIT. Troubled Russian carrier Transaero has tentatively agreed to take 12 A330neos but the order has yet to be firmed, and is likely to be reviewed as part of a broader fleet plan if, as seems likely, the carrier is absorbed into Aeroflot Group.

In addition, Israeli operator Arkia has provisionally agreed to take up to four A330-900neos.

Although the airframer's focus in the future will be on the re-engined variant, Airbus is continuing to roll out a package of improvements on the current-generation aircraft.

Modifications include higher-weight versions of the -300 and -200, with the European Aviation Safety Agency certifying the latter on 8 September, five months after approving the -300 variant.

Both types have a maximum take-off weight of 242t.

Airbus says US Federal Aviation Administration certification of the twinjet "will follow" the clearance from EASA.

The higher performance will extend the A330-200's range to 7,250nm (13,400km), an increase of 350nm on the previous 238t version. Airbus claims that aerodynamic and powerplant tweaks will improve the type's fuel burn. The 242t version is the basic airframe for the re-engined A330neo. ■

INFRASTRUCTURE MAVIS TOH BEIJING

Airbus envisions A350 completions at planned Tianjin facility

Airbus is already eyeing an expanded future role for its planned A330 delivery and completions centre in Tianjin, with the airframer keen for the site to also support its A350 model.

Speaking to *Flight International* in Beijing, Airbus China chief operating officer Rafael Gonzalez-Ripoll says the company hopes to have broken ground on the widebody facility by next May. Other infrastructure work at the site will include the construc-

tion of a 600m-long road to connect its existing A320 final assembly line to the new facility.

The target is for the centre to complete its first A330 in October 2017, ramping up over a period of around three years to a production rate of two aircraft per month.

Gonzalez-Ripoll says Airbus intends not only to complete A330s and A330neos at the centre, but also to undertake work on the A350. Although not a final assembly line for

the A330, he sees the fit-out facility as equally important, dealing with "high-level technology" in the cabin.

"Most importantly, it's a great opportunity for Chinese industry to make a step change in its capacity to develop cabin interior components from seats, galleys, panels and everything you can imagine," he says.

Airbus will invest CNY900 million (\$141 million) in the widebody completions project, which also should provide around 300 new jobs. ■

CERTIFICATION KATE SARSFIELD LONDON

EASA validates Legacy 450 as service entry nears

Embraer has secured European Aviation Safety Agency validation for its Legacy 450 business jet. The approval comes hot on the heels of Brazilian and US certification for the superlight aircraft, which is earmarked for service entry in the fourth quarter to an undisclosed US-based customer.

The Legacy 450 – a smaller and shorter-range version of the

midsize Legacy 500 – was launched in 2008 and is the fourth clean-sheet business jet to be developed by Embraer since its Executive Jets division was created 10 years ago.

Brazil-headquartered Embraer says Europe is its third-largest market, with 17% of its 900-strong business jet fleet based in the region. ■



The type is Embraer's fourth clean-sheet business jet in 10 years



ACQUISITION ELLIS TAYLOR SINGAPORE

Boards approve Bohai's Avolon addition

Chairman of Dublin-based lessor endorses \$7.6 billion Chinese takeover, although price has slipped from 10 August high

China's Bohai Leasing has been given the green light for its takeover of Irish lessor Avolon following approval for the \$7.6 billion deal from the boards of both companies.

Avolon says its board unanimously agreed to accept the \$31 per share offer from Bohai, representing a 31% premium above the closing price on 13 July. The offer also represents an 8% premium on Avolon's closing price on 3 September of \$28.68 per share.

The agreed fee is down from the \$32 per share offer announced by Avolon on 10 August, which it says "reflects significant volatility across global equity markets". Bohai will also increase its deposit by \$100 million to \$350 million, which will remain with Avolon if the deal is not completed.

Avolon chairman Denis Nayden welcomes the deal, and



Avolon's future portfolio includes the Boeing 787 and 737 Max

says Bohai is the right shareholder to take the business through its next stage of growth.

"We believe Bohai will enhance Avolon's profile, positioning and relationships in the Chinese aviation market – a market which we believe offers one of the most compelling growth opportu-

nities in global aviation over the next two decades," he adds.

Avolon's major investors – CVC Capital, Cinven, Oak Hill Capital and Singapore's GIC – have agreed to vote in favour of the takeover at an as-yet unscheduled shareholder meeting. Similarly, Bohai's principal shareholder, HNA Group, has

also agreed to back the deal. Bohai's board voted unanimously on 8 September to do the same.

Subject to various approvals, the transaction is expected to close in the first quarter of 2016, Avolon says.

The takeover offer was sparked after an unnamed third party, widely thought to be Avic Capital, made an unsolicited takeover offer in late July for the lessor at \$30 per share.

Prior to that, Bohai had agreed to take a 20% stake in Avolon through a \$26 per share tender offer to shareholders.

Under the agreement, Bohai will assume around \$5 billion in debt, mostly relating to aircraft in the Irish lessor's portfolio.

It lists an in-service and ordered fleet of 259 aircraft, including commitments for re-engined types including the Boeing 737 Max, Airbus A320neo and A330neo. ■

ENVIRONMENT STEPHEN TRIMBLE WASHINGTON DC

FAA selects eight bidders for share of green funding

The US Federal Aviation Administration has selected eight parties to participate in a slightly scaled-down second phase of a programme dedicated to subsidising development of a suite of emission- and noise-reducing technologies for commercial aviation.

Its Continuous Lower Energy, Emissions and Noise (CLEEN) II programme offers up to \$100 million in FAA funding from fiscal years 2015 to 2020 to eight bidders, including Aurora Flight Sciences, Boeing, GE Aviation, a Delta TechOps/MDS Coating Technologies/America's Phenix team, Honeywell, Pratt & Whitney, Rolls-Royce, and a Rohr/UTC Aerospace Systems effort.

In addition to the FAA's funding, each of the companies must spend at least an equal amount on

individual projects, which raises the total investment over the five-year period to \$200 million.

Despite the substantial budget, the FAA's spending on the programme will decline by \$50 million over the five-year CLEEN II initiative, compared with the \$150 million spent during the earlier CLEEN I programme.

The FAA has not released details of each company's plans for projects during CLEEN II. Overall goals include promoting technologies that contribute to a 40% improvement in fuel efficiency compared with a 2000 baseline, and reducing nitrous oxide emissions by 70% relative to a 2011 global standard.

Each project is expected to involve a technology that could transition into the commercial fleet by 2026. ■



Air Berlin

INTERIOR ALEX DERBER LONDON

Air Berlin stretches A330 legroom

Air Berlin is reconfiguring almost of its Airbus A330-200s to provide more legroom in 40 economy-class seats.

The airline will charge more – the same rate as for the type's eight exit-row seats – per "XL" seat in rows 15-19, which will offer 91cm (35.8in) rather than the 76cm legroom in standard economy rows, one of which will be removed to accommodate the stretch.

Refits will begin on 6 October on the first of 11 dual-class A330s

at Air Berlin Technik's Dusseldorf facility, while the carrier's three all-economy A330-200s should undergo similar work after the winter season.

Recaro will manufacture the new XL seats, whereas Flightglobal's Fleets Analyzer database shows that the A330s' current economy seats are manufactured by Zim Flugsitz.

German manufacturer Recaro is already a supplier for Air Berlin's short-haul fleet. ■



**Comac prepares
for new jet's arrival**
AIR TRANSPORT P16

AIR TRANSPORT



FLEET ELLIS TAYLOR SINGAPORE

Cargo weakness behind Nippon's 747 cancellation

Japanese carrier Nippon Cargo Airlines has been identified as the customer behind the recent cancellation of an order for four Boeing 747-8s.

The airframer disclosed the change to its order backlog for August, but did not reveal the airline or whether the aircraft were the passenger or freighter variant.

Nippon sources confirmed it had cancelled the freighters. The airline had ordered 14 747-8Fs.

As with regional rivals, Nippon Cargo has been affected by weakness in the cargo market, which has seen overcapacity.

Boeing's data shows the carrier has received eight -8Fs, with the remaining two on order.

An additional six aircraft are covered by options.

The airframer recorded 70 new orders – all Boeing 737-family aircraft – in September, including 27 737-800s for UK carrier Jet2, 30 737 Max for Chinese carrier Ruili Airlines and respectively nine and four P-8A maritime patrol aircraft for the US Navy and Royal Australian Air Force. Boeing has taken net orders for 447 aircraft this year, including 321 737s, 48 767s, 54 777s and 24 787s, and has delivered 503. ■

**Additional reporting by
Ghim-Lay Yeo in Washington DC**

Indian airline's firm deal for Neos has taken re-engined narrowbody's backlog beyond 4,100 mark

BACKLOG DAVID KAMINSKI-MORROW LONDON

IndiGo order bolsters Airbus

Carrier's commitment for 250 A320neos pushes airframer past net figure of 700 this year

Indian carrier IndiGo's order for 250 Airbus A320neo jets has taken the airframer's net figure to more than 700 for the first two-thirds of the year.

The deal has eclipsed another significant order, for 32 of the type, which Airbus has assigned to an unidentified customer. This customer also ordered eight regular A320s.

IAG carriers British Airways and Vueling accounted for a further 20 A320neos, while three other single-aisle jets – all corporate A320neos – were allocated to an undisclosed client.

Tunisian carrier Syphax Airlines cancelled its three

A320neos, following a previous cancellation of three other A320s. The airline halted operations at the end of July.

The single-aisle agreements pushed Airbus's overall net order figure to 708 for the first eight months of 2015, compared with 447 for Boeing.

In addition, it also recorded orders for 25 A330s during August, although only one customer, Iberia, has been formally identified.

Iberia is taking three A330-200s, confirming the plans disclosed by parent IAG last month.

The remaining 22 A330s have been set against two unidentified

customers, with one taking a mix of 18 -300s and two -200s, and the other a pair of -300s.

Airbus disclosed the agreements in order figures, covering the first eight months of the year.

China's state aviation holding agreed to take 45 A330s, but Airbus has not clarified whether these are among the August order total. Two A330-200s assigned to Inception Aviation, part of a Singapore Airlines order in September 2011, have been cancelled.

Airbus had delivered 397 aircraft by 31 August – including 17 A380s – a few more than the 389 it managed by the same point last year. ■

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MAINTENANCE MAVIS TOH SHANGHAI

Comac prepares for new jet's arrival

Manufacturer in negotiations with MRO providers to form support network ahead of regional aircraft's 2016 service entry

With the service entry of its ARJ21 nearing, China's Comac is in talks with maintenance, repair and overhaul providers to secure a support network for the jet.

Taikoo (Shandong) Aircraft Engineering Company (STAECO) has expressed an interest in providing engineering services but, says Wang Zhenwei, director of flight training at Comac's Shanghai Aircraft Customer Service subsidiary, no agreement has been reached.

However, staff are undergoing training at Comac, he said during an interview in Shanghai.

Comac wants a third-party MRO provider able to conduct heavy maintenance on the type in place before a C-check is required by launch customer Chengdu Airlines.

Wang says creating a customer service and support network has been a steep learning curve.

"Everything was started from scratch. There were no systems,



AirTeamImages

Launch carrier Chengdu Airlines will receive its first example of the indigenous aircraft in November

structure or experienced team," says Wang.

Shanghai Aircraft Customer Service was set up in October 2008, seven months after Comac's inception.

It has developed training for pilots, cabin crew and maintenance personnel and written flight and maintenance manuals.

The manufacturer has also been preparing the technical support and inventory management for the ARJ21.

Wang says Comac is collaborating with sector experts to smooth entry into service, including CAE for technical training, FedEx for parts logistics, and Fokker for maintenance training.

"We need our own capabilities, we cannot pass it on. This has been our stand," says Wang.

With delivery of the ARJ21 to Chengdu Airlines set for November, the centre has been providing training for the carrier's staff. It has also started developing support capabilities for the developmental C919 narrowbody. ■

DESIGN MAVIS TOH SINGAPORE

Partners plan for long-haul

Russia and China aim to finalise proposed joint development of a widebody aircraft this year, which could include joint development of an engine.

Russian media reports, quoting the deputy minister of industry and trade Andrei Boginsky, say Moscow is ready to fund the initial design phase.

In June, Russian manufacturer United Aircraft disclosed that the nations are aiming to develop, build and certificate a widebody aircraft within 10 years.

Details of the specification will be presented in September.

Previous indications had suggested the aircraft would be powered by Rolls-Royce or GE Aviation engines, with a Russian engine in future. ■

MANUFACTURING TOM ZAITSEV MOSCOW

MA60 assembly for Russia's far east

Xian Aircraft MA60 turboprops could be assembled in Russia's far east after a ministry concluded a framework agreement with the Chinese airframer.

The pact, co-signed by Jiangsu Baoli International Investment, stipulates an assembly line near Komsomolsk-on-Amur.

Regional development minis-

ter Alexander Galushka said Chinese partners took an interest in a facility after an economic forum in Vladivostok.

"They're talking about the MA60 turboprop with a view to producing it for export to 16 countries, including Russia," says Galushka. "Creating an advanced development territory

plus rouble depreciation make that scheme attractive from the export standpoint."

Jiangsu Baoli International Investment will manage the project. "We intend to start MA60 final assembly, and phase-in parts production gradually," says chief executive Zhong Dehong.

He estimates investment requirements for the plant at \$100 million and suggests it could annually produce around 50 aircraft after reaching full capacity. The parties want to draft a business plan and funding for the project by November.

Komsomolsk-on-Amur already has considerable aviation interests with United Aircraft's KnAAPO production facility – which assembles the Sukhoi Superjet 100 – located in the city. ■



AirTeamImages

Xian Aircraft turboprops could be built in Komsomolsk-on-Amur



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RESULTS

DAVID KAMINSKI-MORROW
LONDON

UAC revenue up, but still posts loss of \$305m

Russia's United Aircraft saw its operating loss treble to more than Rb20 billion (\$305 million) over the first half of 2015.

United Aircraft – which owns the Sukhoi, Tupolev, and Irkut design bureaux – states that it increased revenues by a third, to Rb103 billion, although currency depreciation means this figure is down in US dollar terms.

Its Sukhoi division generated revenues of Rb24.8 billion while Irkut turned in Rb20 billion. Both include revenue from military aircraft.

The company says its overall revenue hike has been driven by modernisation and overhaul income of Rb17 billion, as well as contracts for aircraft and component manufacture amounting to Rb11 billion.

But its expenditure rose by 45% during the six months to 30 June, leading to a near-25% drop in gross profit, to Rb9.8 billion.

The company says that debt servicing has become more expensive. Its net debt has increased slightly, to Rb264 billion, since the end of 2014.

This does not take into account a state support measure consisting of a Rb100 billion capitalisation to restructure Sukhoi's civil aircraft division, adds United Aircraft.

Its overall first-half operating loss reached Rb20.4 billion and, after financial income and expenditure, the consolidated net loss increased by nearly a third to almost Rb17 billion.

Meanwhile, Sukhoi – which produces the Superjet 100 – generated a Rb1.77 billion pre-tax profit for the first six months of 2015, reversing the pre-tax loss of Rb4.9 billion recorded in the same period in 2014.

Revenues rose by more than 50% to nearly Rb9.5 billion, which it attributes primarily to the appreciation of the US dollar, in which the sales of its aircraft are denominated. ■

FLEET AARON CHONG SINGAPORE

Singapore A380 cabin upgrade delayed

Singapore Airlines has delayed the full roll-out of its new premium-economy cabin across its Airbus A380 fleet after finding the work was taking double the time anticipated to complete.

The carrier had expected seven of the superjumbos to have been finished by September, but only three have had the new cabin installed, it says. Work that was due to last seven days is instead taking 14, it adds.

"The work on all 19 A380s was



SIA will retrofit 19 A380s

due to have been completed by the first quarter of the 2016, but this has now slipped to the second quarter," says the airline, but

stresses it is "working to complete the installation programme as quickly as possible".

Its installation schedule for the premium-economy cabin on its Boeing 777-300ER fleet remains unaffected, however.

UK-based JPA Design created the new cabins on both aircraft types, with seats supplied by ZIM Flugsitz and Zodiac Aerospace. The A380 will feature 36 seats in premium economy, while the 777-300ERs will have 28. ■

ACQUISITION DAVID KAMINSKI-MORROW LONDON

Russian regulator to analyse effects of Transaero takeover

Competition authority could direct Aeroflot to sell part of its network on monopoly routes

The competition regulator of Russia is to examine the impact of an Aeroflot acquisition of Transaero, after the flag-carrier's board approved plans to take control of the struggling private airline.

But Federal Anti-monopoly Service chief Igor Artemyev, during a briefing, said that the takeover will reinforce Aeroflot Group's position in the market, giving it some 50% of the passenger numbers, and the regulator would have "preferred" a bankruptcy proceeding.

This would have provided an option to satisfy creditors, to an extent, while enabling several airlines, rather than one, to pick up parts of the route network, he adds. But he also indicates that bankruptcy would have been a drawn-out process lasting two or three years.

Artemyev says the authority will look at the acquisition plan and could demand that Aeroflot sells part of its network – both international and domestic – on sectors where the company acquires a monopoly position as a result of its merger with Transaero, although such measures might not be implemented immediately.

The regulator has yet to examine the situation fully. "We will



Transaero proposed the sale of a 75% stake to its Moscow rival

analyse all of it," says Artemyev.

Competition concerns prompted the Federal Anti-monopoly Service to intervene in 2008 when Aeroflot was considering taking a shareholding in S7 Airlines.

Transaero has confirmed that its shareholders have put an offer to Aeroflot to sell a majority stake in the private carrier.

It says that its primary owner submitted the offer, for a stake of 75% plus one share, adding that the proposal has been made "in the interests of passengers, employees, partners and creditors".

Transaero has yet to give further details on the consolidation

process. But it has criticised local media comments about the struggling company, claiming that these "destabilise" its situation.

Transaero has been under intense financial pressure and has newly posted a net loss of Rb8.6 billion (\$128 million) for the first half. Its revenues for the six months to 30 June increased by 3% to Rb50.4 billion, the company says in an interim statement.

Transaero's income from international passenger transport slipped to Rb35.7 billion but its domestic sales activity rose by 30% to Rb12.3 billion. ■

See News Focus P23



USAF aiming to keep LRS-B on target
DEFENCE P20

DEFENCE

PROGRAMME GREG WALDRON SINGAPORE

PC-21 to meet Australian trainer need

"Team 21" consortium led by Lockheed Martin selected as preferred bidder for Canberra's PC-9 fleet replacement deal

Australia's Department of Defence has selected a Lockheed Martin-led consortium as the preferred bidder for the country's basic military flight training requirement.

The deal will see the delivery of 49 Pilatus PC-21s, the DoD says. The 'Team 21' consortium is led by Lockheed and also includes Pilatus and Hawker Pacific.

"The Air 5428 pilot training system project will provide the Australian Defence Force with a new training system to take pilots from flight screening through basic and advanced flying training," says Lockheed, adding that it will work with Canberra's Capability Acquisition and Sustainability Group "to finalise and implement this vital programme".

If Team 21 concludes the contract, it will provide the air-



Pilatus will deliver 49 of the aircraft from later this decade

craft, along with flight-line support, training facilities, campus accommodation and facilities, plus courseware, simulators and other synthetic training devices. The Australian Defence

Force will provide flying training instructors.

To replace the Royal Australian Air Force's current fleet of 63 PC-9/As, the Swiss-built trainers will be purchased by the nation

and placed on its military aircraft register. They will support the instruction of pilots for types ranging from the NH Industries MRH90 transport and Airbus Helicopters Tiger attack rotorcraft to the Lockheed F-35A.

Australia had also evaluated a rival bid from a BAE Systems Australia-led team, which was based around the Beechcraft T-6C and a partnership with CAE Australia.

BAE's existing contract to provide basic flying training at Tamworth, New South Wales will end in 2019. The Project 21 team will establish the replacement capability at the RAAF's East Sale base in Victoria.

Australia follows Qatar, Saudi Arabia, Singapore, Switzerland and the United Arab Emirates in acquiring the PC-21. ■

ACQUISITION ANNO GRAVEMAKER ARNHEM

More Chinooks set to lift Dutch forces

The Dutch defence ministry is to acquire 14 new Boeing CH-47F transport helicopters, in an expansion of its existing rotorcraft capabilities.

Recognising the Chinook's importance in missions such as deploying quick reaction forces and humanitarian assistance, the Dutch air force has decided to retire its 10 ageing CH-47Ds – which were delivered from 1995 – and also upgrade its existing six F-model examples, which entered use from 2013.

The defence ministry had explored the option of acquiring the new aircraft in its preferred CH-47F (NL) configuration, but the cost exceeded available funds. Instead, it will buy F-model Chinooks in the US Army's common avionics architecture system standard via the service's second multi-year procurement deal with Boeing.

The ministry intends to sign a letter of offer and acceptance for

the Foreign Military Sales deal during December.

Following their delivery – from 2019 – the Dutch aircraft will undergo modifications in the USA to meet operational demands and certification standards. These will include installing crash-protected seats in the cockpit and cabin and a VHF radio to enable secure communications with ground forces. Self-protection and icing detection equipment, a fast rope insertion

and extraction system and an emergency locator transmitter will also be provided, along with a piloting function for its forward-looking infrared system.

The Netherlands' total budget for the acquisition is €915 million (\$1 billion), including the cost of modernising its current six CH-47Fs to the same standard.

Separately, Boeing has delivered its last of seven CH-47Fs ordered for the Australian army during 2012. ■



The Netherlands already operates six examples of the CH-47F

REQUIREMENT
GREG WALDRON SINGAPORE

MRTT out from Japan contest

Airbus Defence & Space will not offer its A330 multi-role tanker transport (MRTT) for a Japanese requirement totalling four aircraft, attributing its decision to concerns about the conduct of the competition.

"Allowing a competing bid to be sourced via a US Foreign Military Sale without a mechanism to make a fair price comparison makes it extremely difficult for any other company to compete," says Airbus. "It would be an inappropriate use of shareholders' funds and company resources to bid on this contract."

Tokyo issued a public notification about its intention to buy four tankers in June. Airbus believes the Japanese process should have considered the A330 MRTT's "increased combat effectiveness", and describes Boeing's 767-based KC-46A as "a smaller and less efficient aircraft". ■



REQUIREMENT JAMES DREW WASHINGTON DC

USAF aiming to keep LRS-B on target

With a decision between Boeing/Lockheed and Northrop Grumman's bids imminent, details of the future bomber emerge

With a contract announcement imminent, new details have emerged about the US Air Force's future Long-Range Strike Bomber (LRS-B) that paint the classified project as being less exotic and probably more affordable than previously thought.

In the run-up to a selection between Northrop Grumman and a Boeing/Lockheed Martin partnership, air force officials briefed a dozen Washington-based analysts about the bomber, delivering the message that its technologies are more mature and ready than previously disclosed.

There are no flying demonstrators, but plenty of prototyping activities and wind tunnel tests have been done, in addition to efforts to ready critical subsystems. The optionally-manned, penetrating bomber will feature "very mature" technologies powered by an advanced derivative of an existing engine, sources suggest.

"The designs are at an unusually high level of detail and development for a system in which the prime contractor has not been selected," says one government analyst who attended the briefing.

It has been 14 months since the USAF released its request for proposals for what has been dubbed the "B-3" by some – but the anticipated award date seems to change with each season. The original plan was for an award by May, but this slipped to before August and is now expected later this month or possibly in October.

The competing designs are generations ahead of the Northrop B-2, but perhaps not radically different. And while there had been talk of an unmanned companion, it now seems that the bomber will operate alone, or as part of a strike package with other airborne attack and reconnaissance assets.

LRS-B is not a repackaging of the Next-Generation Bomber that was cancelled in 2009, and it appears that the air force has taken a more sophisticated approach this time.



US Air Force

The B-2 programme was set up to deliver hundreds of aircraft, but the requirement was cut to just 21

The selected aircraft will have global reach and a heavy payload, but might be similar or smaller in size than the B-2, sources say. It will eventually replace the Boeing B-1 and B-52, and carry weapons probably ranging from the 130kg (286lb) Small Diameter Bomb to the 13,600kg Massive Ordnance Penetrator.

BEST OF BREED

The aircraft will be cleared to carry nuclear weapons within two years of achieving initial operating capability in the mid-2020s, and then outfitted to fly unmanned several years later.

Andrew Hunter, a defence industry analyst at the US Centre for Strategic and International Studies, tells *Flight International* that the government appears to have given the prime contractors a great amount of design flexibility, and that each has taken a "best-of-breed" approach to choosing subsystems.

The USAF says it wants to purchase between 80 and 100 new bombers at \$550 million each. Hunter says that figure was primarily a design constraint used as an "appetite suppressant".

"The air force hasn't built a bomber in 20 years, so there's quite a bit of pent-up demand for

the kinds of things the current bombers don't do," he says. "That's why these systems experience so much requirements creep: because they only come along every few decades, it's an all or nothing game for folks trying to get their specific capability put on the system."

"The air force hasn't built a bomber in 20 years, so there's a lot of pent-up demand"

ANDREW HUNTER

Defence analyst

Instead of delivering everything at once, the air force is insisting that the bomber comply with its new open mission system standards, which should enable fresh capabilities to be installed within weeks or months, instead of years. The air force stresses that this bomber programme has also implemented "better buying power" acquisition practices mandated by the Pentagon.

Hunter notes that the B-2 programme was set up to deliver hundreds of stealth bombers, but that when the requirement was cut from more than 130 aircraft to 21, the unit cost ballooned.

LRS-B will proceed cautiously, he believes, due to the difficulty of integrating the engines, sensors and communications equipment into a low-observable airframe, and production rates will be low.

CYBER-ESPIONAGE

The USAF will not discuss broad specifications like approximate range and payload capacity, and no brand names have yet been disclosed by Northrop, Boeing or Lockheed. Sources say the air force is concerned about the design being copied by potential adversaries China and Russia – as well as cyber-espionage against suppliers and the development of counter-weapons.

But the service faces a dilemma, because it needs an estimated \$41.7 billion from Congress over the next decade to support the programme, and probably double that through to 2035. To help make the case for the aircraft, Hunter thinks more details about its cost and schedule will be released at the time of the award.

The B-2 was not revealed to the public until it was well into production, but whether the USAF can afford to repeat that level of secrecy at a time of stagnant defence budgets remains to be seen. ■



ROTORCRAFT GREG WALDRON SINGAPORE

India's LCH rises above its hot-and-high challenge

India's Hindustan Aeronautics (HAL) has carried out hot-and-high flight testing with its light combat helicopter (LCH) from the northern city of Leh.

The activity saw the aircraft operating "under extreme weather conditions at different altitudes", HAL says – with the latter ranging from 10,500–15,700ft. Temperatures experienced varied between 13°C and 27°C, it adds.

The aircraft involved was HAL's third LCH prototype, designated TD-3. For the trials, this was configured with an electro-optical/infrared sensor pod, rocket launchers, a 20mm cannon and air-to-air missile launchers.



Prototype aircraft TD-3 was deployed to the northern city of Leh

HAL notes that the LCH was able to take off and land at high altitudes carrying "reasonable amounts of weapons and fuel", but the company does not provide further details.

Given India's diverse geography, the LCH has already been tested in a number of environments, including high-altitude cold weather, sea level, tropical, and hot and dry conditions.

With a maximum take-off weight of 5.8t, the LCH is a development of HAL's Dhruv advanced light helicopter. France's Turbomeca helped to develop its twin Shakti engines.

Features include low observable characteristics, a glass cockpit, crashworthiness and the ability to operate at night. Mission systems include a helmet-mounted sight, electronic warfare system, directional infrared countermeasures and laser jammer, a datalink, and infrared suppressors.

HAL expects to produce 179 examples for the Indian military, but the programme has suffered from delays. ■

DELIVERY CRAIG HOYLE LONDON

Early arrival for second RAF Airseeker

Latest Rivet Joint signals intelligence aircraft – received months ahead of schedule – features more than 60 enhancements

The UK has received its second of an eventual three Boeing RC-135W Rivet Joint signals intelligence aircraft, and has detailed a package of enhancements introduced with the refurbished jet since its lead example entered Royal Air Force use a year ago.

Aircraft ZZ665 was accepted at RAF Mildenhall in Suffolk, as the service's Waddington base is closed for runway resurfacing.

The arrival of the second aircraft on 3 September happened seven months ahead of schedule, and the Ministry of Defence says it "will be deployable on operations within a matter of weeks".

Its first example "is currently employed alongside other RAF units in the fight against ISIL, supporting operations in Iraq and

Syria", the service adds. "Since delivery of the first aircraft last year, over 60 improvements have been incorporated into the second aeroplane, ranging from upgrades to the aircraft's mission systems to engine improvements providing increased fuel efficiency and durability," the MoD says.

Lead platform ZZ664 is to later undergo an upgrade programme to bring the aircraft in line with the improvements made on the second", it adds.

The final aircraft to be delivered under the roughly £650 million (\$988 million) Airseeker programme will be handed over during 2017, following its conversion from a surplus KC-135 tanker by L-3 Communications in Greenville, Texas.

According to data released by the MoD, each of the RAF's RC-135Ws can operate up to an altitude of 50,000ft with a crew of two pilots, one navigator and up to 25 mission crew.

The aircraft "not only gathers

data and vital intelligence using advanced sensor technology, but is also able to carry out onboard analysis and distribute the information to be exploited by assets on the ground via its high-tech communications suite", it adds. ■



The surveillance type was received at Mildenhall on 3 September

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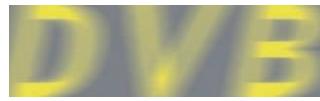
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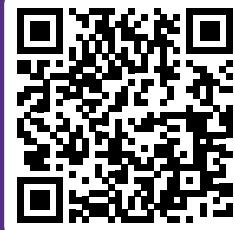
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INTEGRATION EVGENY VAN DER GEEST LONDON

'Transaero' faces period of turmoil

Acquisition of national rival by state-run carrier to stave off bankruptcy proceedings will spark major fleet rationalisation

As Russia braces itself for its usual brutal winter – with economic conditions to match – Transaero and its prospective new owner Aeroflot must prepare for an arduous journey toward integration and ultimate business transformation.

The initial obstacles to be surmounted – approval by shareholders and the competition authorities – appear as mere formalities compared with those lying further down the road.

A glance at the fleets of both carriers shows the scale of the problem. Transaero's 98 in-service aircraft – 91 of which are Boeings – have an average age of 16 years, versus a mere five years for Aeroflot's 163-strong fleet of 118 Airbus jets, 25 Boeings and 20 Sukhoi Superjets. Both have also committed to the Irkut MC-21, with a total order for 62 examples of the developmental twinjet.



AirTeamimages

Aeroflot's increasing stranglehold on the Russian market harks back to its Soviet-era heyday

Swinging cuts must lie ahead, and Transaero's 21 737 Classics seem candidates for phase-out. Those narrowbodies have an average age of 22 years, and are unlikely to retain much residual value. Transaero and Aeroflot both operate fleets of much newer 737-800s, and both fly A321s too, although Aeroflot has vastly more of these than Transaero.

Decisions on how to streamline the combined long-haul fleet can probably be postponed slightly. Transaero's in-service widebody fleet of 45 aircraft – 14 747-400s, 18 767s and 13 777s – is bigger than Aeroflot's, which consists of 13 777s and 22 A330s, though the flag carrier also has A350s and 787s on order.

A big question mark overhangs the fate of Transaero's 12 tentatively ordered A330neos and four firm A380s. However, in any negotiations with Airbus on these, Aeroflot can at least be emboldened with the knowledge that the European airframer will be keen on retaining a Russian client.

More broadly, Aeroflot-Transaero will need to rationalise various dollar-denominated lease deals, given the impact on revenue of the sharply depreciated rouble.

Before any long-haul fleet plan can be finalised, however, there are huge cultural challenges to address. Transaero is a very different animal from state-owned Aeroflot. Under the leadership of Olga Pleshakova, Transaero has had the air of a confident, modernising private-sector independent, and a philosophical clash seems inevitable as the airline joins the powerful host of regional carriers that have been subsumed by Aeroflot since the early 1990s.

There has already been a strong hint that big changes will happen up the managerial chain. After news of the putative Aeroflot deal

broke, it emerged that Pleshakova had been succeeded by Dmitry Yerzakovich. However, he lasted under a week before in turn being replaced by Aeroflot executive Dmitry Saprykin.

IN THE BALANCE

The Russian government's motivation in moving to secure the future of Transaero is multifaceted. Beyond potential integration benefits there lies the Transaero debt mountain, owed to state-banking institutions like Vnesheconombank and Sberbank.

With the nation's carriers queuing up for assistance from government, it makes sense for the authorities to simplify negotiations – and perhaps reduce the level of payouts – through market consolidation. However, it is a blow to market competition. With UTair deep in the red, Russia may soon be a country of two-and-a-half airlines, with only S7 as a sizeable independent and the shadow of the state extending ever further.

But if Aeroflot-Transaero can be seen as a victory for pragmatism in the face of adverse market conditions, it is far from a quick fix. This will be a long drawn out process. The only comfort for the Russian government may be that it is easier to embark on this journey now, rather than later in 2016 after that inevitable bad winter. ■

Evgeny van der Geest is senior analyst, risk advisory with Flightglobal's Ascend consultancy

AEROFLOT AND TRANSAERO FLEETS

Type	In service	On order	Option/Lol	Stored
Aeroflot fleet				
Airbus A320 family	96	49	0	0
Airbus A330	22	0	0	0
Airbus A350**	0	22	0	0
Boeing 737 NG	12	35	15	0
Boeing 787	0	26	0	0
Boeing 777-300ER	13	7	0	0
Ilyushin Il-96	0	0	0	3
Irkut MC-21	0	50	0	0
Sukhoi Superjet 100	20	10	0	0
Total	163	199	15	3
Transaero Airlines fleet				
Airbus A320 family	2	12	0	0
Airbus A330neo	0	0	12	0
Airbus A380	0	4	0	0
Boeing 737 Classic	21	0	0	2
Boeing 737 NG	25	11	0	0
Boeing 767*	18	0	0	0
Boeing 777**	13	0	0	1
Boeing 747-400	14	0	0	5
Boeing 747-8	0	4	0	0
Irkut MC-21	0	12	0	0
Tupolev Tu-204	2	0	0	0
Tupolev Tu-214	3	0	0	0
Total	98	43	12	8

NOTE: *200ER/300ER. **200/200ER/300. *** includes eight -800s

SOURCE: Flightglobal's Fleets Analyzer database



ROTORCRAFT DOMINIC PERRY LONDON

Redesign under way for Kazan Ansat

Light twin to be “modernised” to gain higher MTOW and longer range, plus interior improvements, for 2016 delivery

Russian Helicopters has embarked on what appears to be a substantial redesign of its Kazan Ansat light twin-engined rotorcraft in order to increase its market appeal.

The manufacturer recently secured certification from Russian aviation regulator MAK for the addition of a stability augmentation system for the hydro-mechanical control-equipped civil variant of the Ansat, and is now proposing a number of other improvements under a “modernisation” initiative.

Possible changes include an increase in the take-off weight from its present 3.6t maximum, larger 750kg (1,650lb)-capacity fuel tanks, with an additional 200kg reserve to boost range from the current 280nm (515km), changes to the pilot and passenger doors, and improvements to the passenger cabin such as better noise attenuation, enhanced ventilation and, in a proposed VIP interior, the addition of a toilet.

Initially developed with fly-by-



The Ansat has secured certification for a stability augmentation system

Bilipix

wire (FBW) controls, these were later dropped from the civil variant of the Ansat in favour of a regular hydro-mechanical system because of uncertainty over the regulations covering civil certification of FBW-equipped rotorcraft.

Deliveries of the Pratt & Whitney Canada PW207K-powered Ansat, with the stability augmentation system as standard, are due to begin next year, says Russian Helicopters.

Meanwhile, the manufacturer

appears to be closing in on the final stages of certification for its serially delayed Mil Mi-38 heavy-lift helicopter, which has been in development since the early 2000s.

It says it is aiming to finalise the approval process with MAK by year-end, although it sees potential for global sales of the 15.6t type.

The fourth flight-test prototype of the Mi-38, which took to the skies in late 2014, is largely con-

gruent with the final production model and is equipped with Klimov TV7-117V engines, rather than the P&WC PW127s used on early prototypes.

The 2,800shp (2,090kW) Russian-built powerplants received type certification in the first half of 2015, says Russian Helicopters.

Potential uses include offshore, medical evacuation and executive transportation, with a VIP example present at the recent MAKS air show in Moscow. ■

STRATEGY DOMINIC PERRY LONDON

AS355 light twin shelved as product focus narrows

Airbus Helicopters has dropped the AS355 Ecureuil II light twin from its range, as part of a drive to rationalise its portfolio and focus on key products.

Production of the 2.6t helicopter – which is also known as the Twin Squirrel or Twin Star in the USA – is, however, likely to continue through next year, as the airframer runs through its remaining order backlog.

The manufacturer says the decision was driven by a need to trim its product range and focus on stronger-selling models to better answer the needs of the market and its customers. Production of the two other rotorcraft in the Squirrel family – the H125 and H130 – will continue, however.

“Airbus Helicopters remains committed to continuous improvement of the H125 and H130 for higher competitiveness and increased customer satisfaction,” it says, while adding that it “will continue to support the more than 600 AS355s currently in service worldwide.”

Although in production since 1979, the AS355 has from 2007 been offered as the NP variant, which is fitted with FADEC-equipped Turbomeca Arrius 1A1 engines and boasts a fast cruise speed of 120kt (222km/h) as well as a maximum range of 395nm (731km).

Flightglobal’s Fleets Analyzer database records a backlog for the type of just seven aircraft. ■

ORDER DAVID KAMINSKI-MORROW LONDON & TOM ZAITSEV MOSCOW

Twin Otters for Russia’s Rosneft

Canada’s Viking Air has sold 10 Twin Otter Series 400s to Russia’s Rosneft, to be handed over to the energy giant between November 2015 and early 2017.

The petroleum firm will operate the aircraft – a modernised variant of the de Havilland Canada DHC-6 – in a corporate shuttle, regional commuter and freight transport role.

Viking says discussions centred on a dedicated Series 400 facility in Russia, offering maintenance and other services, are “still ongoing” with its Moscow-based sales agent, Vityaz Avia.

However, plans to produce the aircraft under licence for the local market have been shelved by the partners, after Russia’s Ulyanovsk regional authorities last month revoked an agree-



Series 400 lacks local demand

ment to lease land for the manufacturing facility. The move was blamed on a lack of demand for the Series 400 in the region.

Viking and Vityaz hoped to start production this year, and invest around \$15.5 million in the venture. Plans called for the manufacture of up to 24 Series 400s annually, with parts to be produced locally.

Neither company was available for comment. ■



Final assembly of the large-cabin, ERJ-based Legacy 650 has been performed in China since 2012

DISPUTE MAVIS TOH BEIJING

Tax row could see Embraer stop production in Harbin

Manufacturer says 20% levy on components makes Chinese line more costly than Brazil

Brazil's Embraer has cast doubt on the future of its Chinese business jet assembly line, warning that unless it can strike a deal with Beijing over a tax row, it could cease production at the Harbin facility.

Embraer's grievance centres on import duties averaging 3% on components and 17% value added tax. "There's a 20% cost that makes production costs higher than our Brazilian line. It's a big challenge," says Embraer China president Guan Dongyuan. Harbin Embraer Aircraft Industry – a joint venture between Em-

braer and AVIC set up in 2003 – formerly assembled the ERJ-145 regional jet switching in 2012 to production of the ERJ-based Legacy 650 business aircraft.

The airframer had wanted to make the larger E-190 regional jet in China, but the authorities did not approve the switch; a decision likely to have been coloured by the nation's efforts to develop its own indigenous regional type, Comac's ARJ21.

Guan says the situation "is not ideal" and the tax issue has limited production to two aircraft per year, despite capacity for 15. To

date it has delivered four large-cabin Legacy 650s from the line.

"We hope we can get some feedback as soon as possible. We have to make a final decision before the end of next year," says Guan.

While Embraer does not rule out the possibility of ceasing production in China, Guan stresses that this is a situation the manufacturer is trying to avoid.

"If we can't [resolve this issue], other foreign companies will face the same problem, unless they set up in free trade zone areas," says Guan. ■

MODIFICATIONS
KATE SARSFIELD LONDON

New paint facility lets Gulfstream refresh its range

Gulfstream has opened an 8,170m² (88,000ft²) paint facility at its Savannah headquarters, specifically for in-service models. The decision was prompted by the increasing number of Gulfstream owners looking to refresh their aircraft.

"Demand for the new Gulfstream aircraft is strong and so is the demand for enhancing aircraft already in service," says Joe Rivera, vice-president and general manager for the Savannah service centre.

"This new facility will give our customers a dedicated space for our product support organisation to tackle their paint requests – from full strip-and-paint jobs to custom livery and logo applications."

The paint shop's proximity to the service centre makes it an ideal location for customers who need maintenance and/or refurbishment work to go along with painting an individual part, multiple parts or even the entire aircraft, Rivera adds.

According to Flightglobal's Fleets Analyzer database, the global fleet of Gulfstream business jet totals nearly 2,000, of which around 1,300 are based in North America. ■

UPGRADE KATE SARSFIELD LONDON

Modular floor to broaden appeal of Pacific P-750

New Zealand's Pacific Aerospace (PAC) has developed a quick-change, modular floor for its P-750 XSTOL (extremely short take-off and landing) aircraft, to widen the appeal of the single-engined turboprop.

"The feature includes removable role equipment supplied by PAC, and is standard on new P-750s," says chief executive Damian Camp. The first example recently entered service with a Chinese operator.

"This model will be particu-

larly appealing for companies bidding for multi-mission contracts, as it allows them to adapt easily between roles as diverse as crop dusting, passenger transport and medical evacuation," he adds.

Its modular floor also eliminates the cost and inconvenience of adapting the aircraft for each mission by an authorised design organisation, says Camp.

"The quick-change floor can be adapted for around a dozen missions including fire-fighting and

surveillance," he says. Since entering service in 2001, the P-750 has largely been used as a skydiving platform and for passenger and cargo transportation – mainly serving remote communities within Malaysia, the Philippines and Indonesia.

The 10-seat P-750 XSTOL is certificated by 18 regulators, including the USA and in Europe, and in June secured Brazilian approval. "Latin America is our next big push," says Camp. "The aircraft's short-field performance

is also ideal for the demanding operating conditions of this particular region."

The \$1.8 million, Pratt and Whitney Canada PT6A-34-powered aircraft takes 220m (750ft) to take off carrying a useful load of 1,900kg (4,200lb), with a 1,180nm (2,190km) range.

Hamilton-based PAC – which also produces the CT-4 two-seat trainer and Cresco agricultural aircraft – expects to deliver seven P-750s this year, including its 100th unit. ■





pwc

Is aerospace riding an economic super-cycle? Our annual Top 100 analysis documents another boom year, but the coming period may be more challenging

DAN THISDELL LONDON

Aerospace industry financial data from 2014 underscores the obvious: this industry is riding a decade-long growth wave. Our analysis, compiled by the aerospace experts at PwC, shows that, barring a wobble during the darkest days of the financial crisis, makers of aircraft and their suppliers mostly sloughed off the downturn and then surged during an otherwise weak recovery. Indeed, aerospace can be said to be enjoying an economic super-cycle.

All-time sales records have fallen two years running, and growth is pushing double digits. The big two, Boeing and Airbus, are delivering aircraft, and taking orders, at rates that would have gobsmacked industry bosses 15 years ago – validating, it would seem, long-range demand forecasts that are giving today's aerospace leaders the confidence to invest.

Can it go on? The optimistic assumption has long been that rising wealth in emerging markets is translating into a demand for travel that will endure – and aerospace growth has been outpacing world GDP for years.

But Brazil and India are on the buffers. Russia is suffering and only a fool would assume that a Chinese crisis – and hence, quite possibly, a global crisis – is out of the question. The slump in oil prices takes the urgency out of replacing ageing, relatively thirsty, aircraft fleets. And turmoil in the Middle East might lead US and European governments to boost defence spending, but the net effect of conflict would surely be negative.

But as many an industry insider has noted, even if half the orderbook evaporated, the aerospace industry would still be in fine shape. ■



To view our full list of the Top 100 aerospace companies, including revenue and profit figures, visit flightglobal.com/top100



Gary Reedford represented by Merklepon

1 BOEING



787 is all action...

Revenue: \$90.8 billion (+4.8%)

Profit: \$7.47 billion (+13.9%)

Margin: 8.2%

boeing.com

As Ray Conner, boss of Boeing's dominant Commercial Airplanes unit, put it back in January: "In the face of fierce competition, we had a strong year." We'll give you that, Ray – 1,432 firm orders wrapped up 2014 with a record backlog despite a truly stunning 723 deliveries. Meanwhile, the whole company turned in another record revenue performance despite a 12% downturn, to \$13.5 billion, at defence, space and security.

Though there's nothing like working from strength, Boeing does have some significant challenges. H2 2015 started with a new boss, as chief operating officer Dennis Muilenburg stepped into Jim McNerney's shoes – and delivered bad news in the form of a \$536 million after-tax charge against the KC-46 tanker programme. The 777-9X and -8X projects look to be making solid headway, but are being watched by well-known hawk Qatar Airways, which may launch both.



...but KC-46 needs to get motoring

Boeing

2 AIRBUS

Revenue: \$80.6 billion (+5.5%)

Profit: \$4.50 billion (+31.9%)

Margin: 5.6%

airbus-group.com

Another year in the number-two slot for Europe's champion is no surprise, though a record 1,456 commercial aircraft orders in 2014 actually topped Boeing. Like its arch-rival, Airbus now has to manage some key programme transitions, in the Neo versions of its A320 and A330, while ramping up A350 output. And, it faces headwinds in helicopters, where its longstanding market dominance faces attack by hungry rivals and an offshore market hammered by low oil prices. Boeing's main advantage is in defence, where being American helps. A lot.



A350: nice livery,
output ramping up well

3 LOCKHEED MARTIN

Revenue: \$45.6 billion (+0.5%)

Profit: \$5.59 billion (+24.1%)

Margin: 12.3%

lockheedmartin.com

The F-35 programme is stumping along, while buying Sikorsky from number four UTC rounds out a defence-focused firm.

5 GE AVIATION

Revenue: \$24.0 billion (+9.1%)

Profit: \$5.0 billion (+15.0%)

Margin: 20.8%

geaviation.com

Last year was the first full year since GE acquired Italian engine components maker Avio, in August 2013.

6 NORTHROP GRUMMAN

Revenue: \$24.0 billion (-2.8%)

Profit: \$3.20 billion (+2.3%)

Margin: 13.3%

northropgrumman.com

Partnered with Gulfstream and L-3, Northrop is doing battle against Boeing and Lockheed Martin for a lucrative USAF competition to replace its ageing JSTARS radar targeting fleet from 2023 – Northrop is the incumbent on that programme, so there's pride and some \$6.5 billion at stake; the next couple of years will determine the outcome.

4 UNITED TECHNOLOGIES (UTC)

Revenue: \$36.2 billion (+6.1%)

Profit: \$4.57 billion (+1.9%)

Margin: 12.6%

utc.com

Selling Sikorsky helicopters to Lockheed Martin will cut \$7.5 billion off the top line; fast-growing GE may just overtake.

+2

Northrop Grumman is locked on



Northrop Grumman

7 RAYTHEON

Revenue: \$22.8 billion (-3.7%)

Profit: \$3.18 billion (+8.2%)

Margin: 13.9%

raytheon.com

International business is solid; see \$2 billion booked to provide Patriot air and missile defence capability for Qatar.

10 ROLLS-ROYCE

Revenue: \$14.7 billion (-3.7%)

Profit: \$2.15 billion (+2.0%)

Margin: 14.7%

rolls-royce.com

After a very successful 2014, the world's number-two aero engine maker faces more than a few hurdles: managing a sales slump while Trent 700s transition to the 7000s that will power Airbus A330Neos, dealing with investor calls to divest marine and energy divisions and, possibly, raising capital to build the R&D muscle needed to keep up with GE.

In a Neo age it will be all right



Airbus

9 FINMECCANICA

Revenue: \$17.2 billion (+6.1%)

Profit: \$715 million (2013 loss: \$246m)

Margin: 4.1%

finmeccanica.com

Several years of financial mayhem look to be over; the focus is now comfortably on aerospace and defence electronics.

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11 BAE SYSTEMS

Revenue: \$13.7 billion (-8.5%)

Profit: not available

Margin: not available

baesystems.com

Much rides on winning new export sales for Eurofighter Typhoon; the US defence market also remains challenging.

12 HONEYWELL

Revenue: \$11.9 billion (-0.3%)

Profit: \$2.92 billion (+22.9%)

Margin: 24.4%

honeywell.com

An upturn in business and general aviation sales provided a late-year surge that continued in the first half of 2015.

14 GENERAL DYNAMICS

Revenue: \$10.5 billion (+4.9%)

Profit: not available

Margin: not available

generaldynamics.com

For GD, aerospace means Gulfstream business jets; production is ramping to meet strong demand for the new G650.

13 BOMBARDIER

+2

Big – too big?



Bombardier

Revenue: \$10.5 billion (+11.9%)

Loss: \$995 million (**2013 profit:** \$418m)

Margin: -9.5%

bombardier.com

Losing money in 2014 is the least of Bombardier's problems, which can be summed up as "CSeries", the new airliner project dogged by delays that has so far failed to reach a critical orders mass. The question is: is this programme bigger than the company?

15 L-3 COMMUNICATIONS

-2



AirTeamImages

Revenue: \$10.1 billion (-4.0%)

Profit: \$1.02 billion (-9.4%)

Margin: 10.1%

l-3com.com

The intelligence, surveillance and reconnaissance systems specialist has substantial capabilities ranging from its core electronics integration to structures and modifications – and its growth underscores a modern maxim, that the heart of a military aircraft today is its electronics, not the airframe.

High-stakes programmes in the balance today include the USAF's JSTARS replacement, where L-3 is on the Northrop Grumman-Gulfstream ticket.

And L-3 is building a substantial presence in civil pilot training, building on two acquisitions in the UK, of Thales's simulator design and manufacture business and training provider CTC Aviation; both are near London's Gatwick airport, and are turning the UK into a major base for the New York-headquartered group.

CTC unit is a rising monarch

TOP 100

SPECIAL REPORT

16 TEXTRON

Revenue: \$10.0 billion (+21.3%)
Profit: not available
Margin: not available
textron.com

17 UNITED AIRCRAFT

Revenue: \$7.40 billion (+29.5%)
Profit: \$145.3 million (+100%)
Margin: 2.0%
uacrussia.ru/en

18 PRECISION CASTPARTS

Revenue: \$7.00 billion (+6.5%)
Profit: not available
Margin: not available
precast.com

19 MITSUBISHI (MHI)

Revenue: \$6.87 billion (+8.6%)
Profit: not available
Margin: not available
mhi-global.com

20 SPIRIT AEROSYSTEMS

Revenue: \$6.80 billion (+14.1%)
Profit: \$354 million (2013 loss: \$364.3m)
Margin: 5.2%
spirit Aero.com

21 TALES

Revenue: \$6.65 billion (+6.4%)
Profit: \$670.1 million (+20.2%)
Margin: 10.1%
thalesgroup.com

22 EMBRAER

Revenue: \$6.29 billion (+0.9%)
Profit: \$543.3 million (-23.8%)
Margin: 8.6%
embraer.com

23 ALCOA

Revenue: \$5.6 billion (+40.2%)
Profit: not available
Margin: not available
alcoa.com

24 ZODIAC

Revenue: \$5.54 billion (+7.3%)
Profit: \$719 million (-3.4%)
Margin: 13.0%
zodiac aerospace.com

25 MTU AERO ENGINES

Revenue: \$5.19 billion (+9.5%)
Profit: \$442.5 million (+5.1%)
Margin: 8.5%
mtu.de

26 ROCKWELL COLLINS

Revenue: \$4.98 billion (+11.3%)
Profit: \$941 million (+5.4%)
Margin: 18.9%
rockwellcollins.com

27 DASSAULT AVIATION

Revenue: \$4.88 billion (-19.9%)
Profit: \$468.1 million (-29.2%)
Margin: 9.6%
dassault-aviation.com

28 AVIC

Revenue: \$4.18 billion (+15.9%)
Profit: \$324.6 million (+13.5%)
Margin: 7.8%
avic.com/en

29 IHI

Revenue: \$4.07 billion (+7.2%)
Profit: \$373.8 million (+7.8%)
Margin: 9.2%
ihi.co.jp/en

30 TRIUMPH GROUP

Revenue: \$3.89 billion (+3.3%)
Profit: \$434.7 million (+8.7%)
Margin: 11.2%
triumphgroup.com

31 ISRAEL AEROSPACE

Revenue: \$3.83 billion (+5.2%)
Profit: not available
Margin: not available
iai.co.il

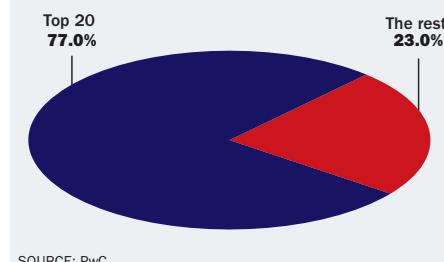
TOP 100

The story looks familiar, with Boeing and Airbus staying head and shoulders above the rest in another year when civil aerospace defied gravity while military sales, at least in major Western countries, remained stuck on hold. Three positions changed in the Top 10, and the only new name in the Top 20 is Spirit AeroSystems, back in profit and with a rate of sales growth bettered by only number 16 Textron and United Aircraft (17), that carried it up three places to take 20th at the expense of Thales. The big players remain strong, with operating margin for the Top 10 rising from 9.3% in 2013 to 10.5% in this 2014 data – Finmeccanica's long-awaited move to black helped, but the whole group shone, with operating profits rising 16.7% to \$39.1 billion.

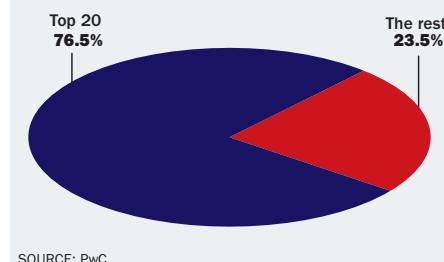
 **3.9%**

Year-on-year growth in Top 20 revenue; numbers 81-100 grew by 5.1%

TOP 20 SHARE OF TOP 100 SALES



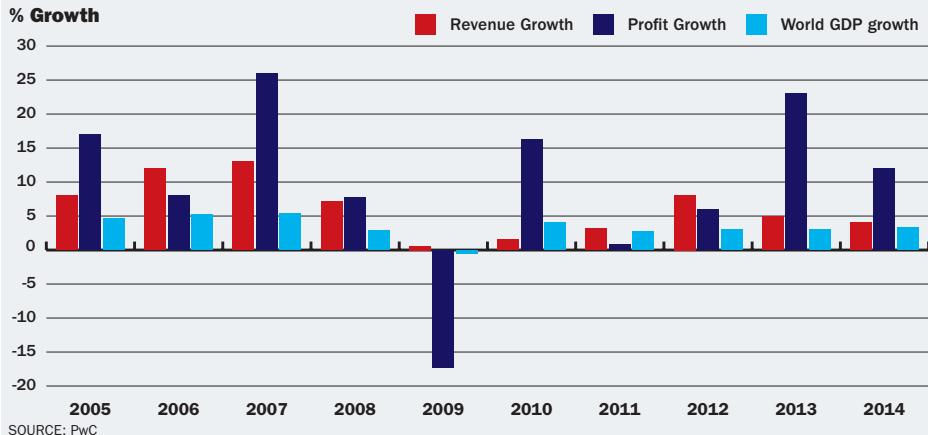
TOP 20 SHARE OF TOP 100 PROFITS



At last, Finmeccanica is out of the red



REVENUE AND PROFIT GROWTH OF THE TOP 100 2005-2014



68

\$613

10.5%

The number of companies posting \$1 billion-plus revenue

In billions, the total revenue of the Top 100 reached another all-time record

Top 10 operating margin; profits jumped 16.7% to reach \$39.1 billion

TOP 20 BY PROFIT GROWTH 2014*

Rank by margin	Rank by sales	Company	Operating margin
1	41	TransDigm	39.1%
2	93	Garmin	27.7%
3	96	Martin-Baker	26.8%
4	12	Honeywell	24.4%
5	33	Harris	23.1%
6	5	General Electric	20.8%
7	36	Hindustan Aeronautics	20.2%
8	79	Crane	19.9%
9	26	Rockwell Collins	18.9%
10	63	Heico	18.0%
11	85	Kaman	17.2%
12	61	Pilatus	17.0%
13	44	Meggitt	15.2%
14	46	CAE	15.2%
15	99	Figeac Aero	15.0%
16	8	Safran	14.9%
17	37	B/E Aerospace	14.8%
18	10	Rolls-Royce	14.7%
19	65	Woodward	14.7%
20	47	Eaton	14.7%

NOTE: *operating profit SOURCE: PwC

TOP 20 BY SALES GROWTH 2014

Rank by growth %	Rank by sales	Company	Sales growth
1	23	Alcoa	40.2%
2	95	Heroux-Devtek	34.2%
3	17	United Aircraft	29.5%
4	99	Figeac Aero	25.6%
5	41	TransDigm	23.3%
6	16	Textron	21.3%
7	84	JAMCO	19.9%
8	66	LISI	18.7%
9	37	B/E Aerospace	18.0%
10	28	AVIC	15.9%
11	34	Kawasaki	15.8%
12	61	Pilatus	15.8%
13	54	Aerojet Rocketdyne	15.5%
14	45	MDA	15.4%
15	43	Korea Aerospace Industries	14.8%
16	58	Fuji Heavy Industries	14.8%
17	20	Spirit AeroSystems	14.1%
18	93	Garmin	13.9%
19	63	Heico	12.2%
20	59	Diehl Aerosystems	12.2%

SOURCE: PwC

32 GKN AEROSPACE	+1	35 ORBITAL ATK	+1	38 ELBIT SYSTEMS	-1
<i>Revenue: \$3.67 billion (-0.8%)</i> <i>Profit: \$456.1 million (+3.0%)</i> <i>Margin: 12.4%</i> gkn.com/aerospace		<i>Revenue: \$2.99 billion (+4.3%)</i> <i>Profit: \$145.8 million (+31.4%)</i> <i>Margin: 4.9%</i> orbitalatk.com		<i>Revenue: \$2.58 billion (+2.5%)</i> <i>Profit: not available</i> <i>Margin: not available</i> elbitsystems.com	
33 HARRIS	-2	36 HINDUSTAN AERONAUTICS	-2	39 COBHAM	+1
<i>Revenue: \$3.63 billion (-0.1%)</i> <i>Profit: \$838.4 million (+1.1%)</i> <i>Margin: 23.1%</i> harris.com		<i>Revenue: \$2.91 billion (+0.6%)</i> <i>Profit: \$586.9 million (+2.3%)</i> <i>Margin: 20.2%</i> hal-india.com		<i>Revenue: \$2.50 billion (+4.8%)</i> <i>Profit: not available</i> <i>Margin: not available</i> cobham.com	
34 KAWASAKI (KHI)	+1	37 B/E AEROSPACE	+4	40 TELEDYNE TECHNOLOGIES	-2
<i>Revenue: \$3.07 billion (+15.8%)</i> <i>Profit: \$343.1 million (+38.3%)</i> <i>Margin: 11.2%</i> global.kawasaki.com/en/mobility/air		<i>Revenue: \$2.60 billion (+18.0%)</i> <i>Profit: \$384.0 million (+5.8%)</i> <i>Margin: 14.8%</i> beaerospace.com		<i>Revenue: \$2.39 billion (+2.4%)</i> <i>Profit: \$294.5 million (+22.6%)</i> <i>Margin: 12.3%</i> teledyne.com	

DEFENCE

Western defence budgets remain under strain, with minus signs generally prevailing in the majors' growth column; UTC is the big outlier, but percentage-wise its growth in 2014 was just a third of what it managed in 2013. However, the coming year could mark a turn in fortune, at least for some. US players can probably expect another year of broad stasis while the election plays out, though Lockheed Martin will get a boost from its imminent acquisition of helicopter maker Sikorsky from UTC. In Europe, the UK is engaged in a defence and security priorities review, and has determined to maintain spending, as per NATO guidelines, at 2% of GDP.

↑ 5.1% ↑ 10.5%

Finmeccanica sales jumped – and Airbus edged up; strength in Europe?

UTC sales pointed the right way, but other US majors were near zero or negative

DEFENCE AEROSPACE SALES GROWTH	
	2014 v 2013*
1 TransDigm	23.3%
2 Pilatus	21.9%
3 Embraer	21.7%
4 Aerojet Rocketdyne	15.5%
5 Heico	12.2%
6 Magellan Aerospace	12.1%
7 United Technologies (UTC)	10.5%
8 Curtiss-Wright	8.7%
9 Esterline	8.6%
10 Zodiac	7.3%
11 Asco	6.8%
12 Precision Castparts	6.5%
13 Amphenol	5.4%
14 Israel Aerospace Industries	5.2%

NOTE: *local currency SOURCE: PwC

DEFENCE AEROSPACE SALES 2014	
	\$ million
1 Lockheed Martin	37,535
2 Boeing	26,249
3 Northrop Grumman	23,979
4 Raytheon	18,378
5 United Technologies (UTC)	17,333
6 Airbus	15,801
7 BAE Systems	13,698
8 Finmeccanica	11,437
9 L-3 Communications	8,819
10 Honeywell	4,754
11 Textron	3,833
12 Rolls-Royce	3,407
13 Israel Aerospace Industries	2,796
14 Cobham	1,880

SOURCE: PwC



Next stop Lockheed Martin

41
TRANSDIGM

Revenue: \$2.37 billion (+23.3%)
Profit: \$927.8 million (+23.8%)
Margin: 39.1%
transdigm.com

44
MEGGITT

Revenue: \$2.17 billion (-5.0%)
Profit: \$321.7 million (-21.3%)
Margin: 15.2%
meggitt.com

47
EATON

Revenue: \$1.86 billion (+4.8%)
Profit: \$273.0 million (+8.3%)
Margin: 14.7%
eaton.com/aerospace

42
PARKER HANNIFIN

Revenue: \$2.24 billion (-1.5%)
Profit: \$271.2 million (-3.2%)
Margin: 12.1%
parker.com

45
MDA

Revenue: \$2.10 billion (+15.4%)
Profit: \$118.8 million (-33.1%)
Margin: 5.7%
mdacorporation.com

48
SAAB

Revenue: \$1.80 billion (+0.1%)
Profit: not available
Margin: not available
saabgroup.com

43
KOREA AEROSPACE

Revenue: \$2.20 billion (+14.8%)
Profit: \$153.1 million (+29.5%)
Margin: 7.0%
koreaero.com/english

46
CAE

Revenue: \$1.95 billion (+7.7%)
Profit: \$295.3 million (+13.4%)
Margin: 15.2%
cae.com

49
EXELIS

Revenue: \$1.77 billion (-1.9%)
Profit: not available
Margin: not available
exelisinc.com

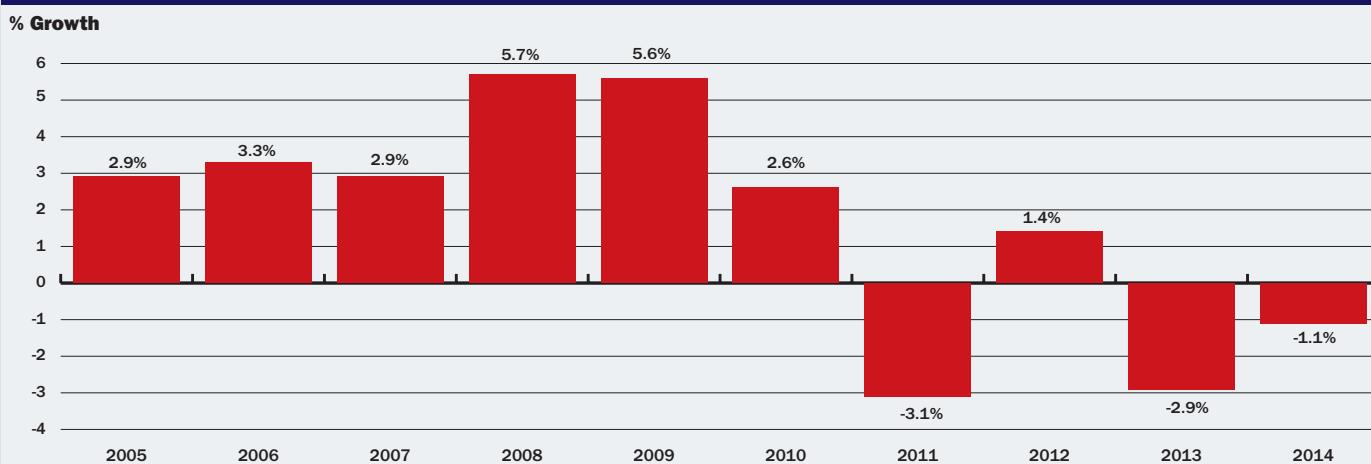
\$178bn

Total 2014 sales of the 10
biggest defence players;
\$2 billion down on 2013



Bavarian Tigers

DEFENCE SALES GROWTH 2005-2014



SOURCE: PWC

ENGINES

Every passenger aircraft needs two engines and some need four, so with upwards of 30,000 new mainliners and approaching 10,000 regionals forecast to be delivered over the next couple of decades, it's a good time to be in the business of making jet engines and their component parts. It's also an exciting time for the engineers – and a correspondingly anxious period for their commercial masters – as no fewer than six clean-sheet commercial engines are expected to be entering service by about 2020. Some of those powerplants will be replacing decades-old workhorses and others will be filling thrust gaps, but new technologies and even all-new aircraft requirements pose huge challenges in the balance between cost, performance, reliability and outright practicality. Pratt & Whitney's success at bringing to reality an old concept, internal gearing, has rivals scrambling to consider seriously going down this route. The ever-improving performance of carbon composites, combined with better mass manufacturing techniques, are also turning attention to exotic designs that would have been unthinkable just a few years ago. And additive manufacturing technologies – so-called 3D printing – are starting a revolution that could turbocharge engine making, at a potentially great disruptive cost.



3.7%

Number two Rolls-Royce saw sales decline – gap to GE is large and growing

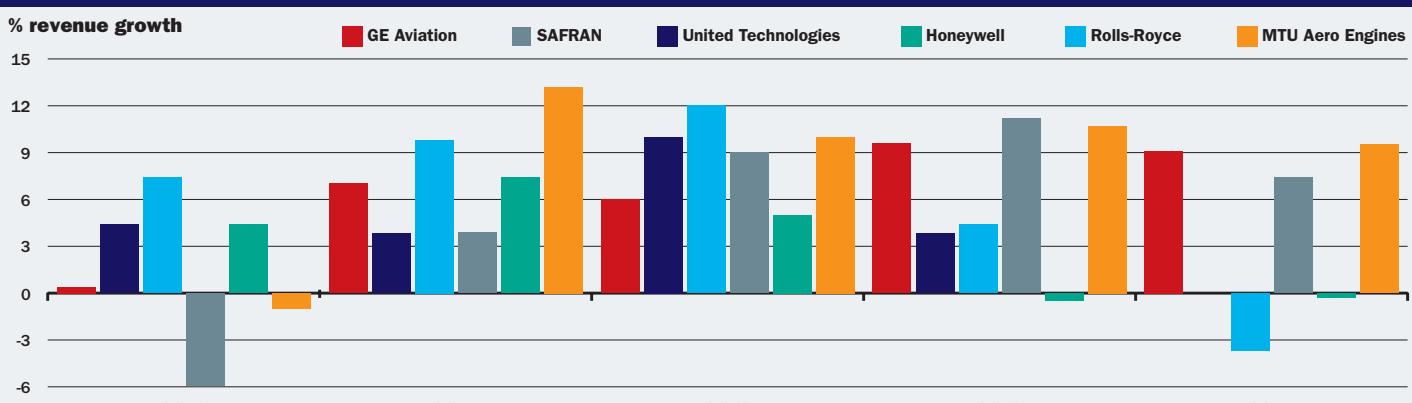
\$82bn

Total sales of the nine biggest sector suppliers – up 4.3% on 2013

9.1%

Sales increase at GE points to continued leadership of sector

ENGINE AND COMPONENT SALES GROWTH 2010-2014



ENGINE AND COMPONENTS SALES 2014

	\$ million
1 General Electric	23,990
2 Rolls-Royce	14,665
3 United Technologies (UTC)	14,508
4 Safran	10,819
5 Honeywell	5,970
6 MTU Aero Engines	5,194
7 IHI	4,069
8 GKN Aerospace	1,723
9 ITP	863

SOURCE: PwC

ENGINES AND COMPONENTS SALES GROWTH

	2014 v 2013*
1 MTU Aero Engines	9.5%
2 General Electric	9.1%
3 Safran	7.4%
4 IHI	7.2%
5 ITP	3.7%
6 United Technologies (UTC)	0.0%
7 Honeywell	-0.3%
8 Rolls-Royce	-3.7%
9 GKN Aerospace	-6.7%

NOTE: *local currency SOURCE: PwC

**50
IRKUT**

Revenue: \$1.71 billion (-10.4%)
Profit: \$72.9 million (-47.3%)
Margin: 4.3%
irkut.com

-5

**56
LIEBHERR**

Revenue: \$1.55 billion (+4.4%)
Profit: not available
Margin: not available
leibherr.com

-2

**51
MOOG**

Revenue: \$1.69 billion (+2.9%)
Profit: \$169.3 million (-7.5%)
Margin: 10.0%
moog.com

+1

**57
ALLEGHENY TECHNOLOGIES**

Revenue: \$1.36 billion (+5.0%)
Profit: not available
Margin: not available
ATImetals.com/markets/aerospace

**52
ESTERLINE**

Revenue: \$1.64 billion (+8.6%)
Profit: \$194.3 million (-1.6%)
Margin: 11.8%
esterline.com

+1

**58
FUJI HEAVY INDUSTRIES**

Revenue: \$1.35 billion (+14.8%)
Profit: \$178.7 million (+33.7%)
Margin: 13.2%
fhi.co.jp/english

+1

**53
ST ENGINEERING**

Revenue: \$1.64 billion (-0.8%)
Profit: \$206.4 million (-10.4%)
Margin: 12.6%
stengg.com

-2

**59
DIEHL AEROSYSTEMS**

Revenue: \$1.29 billion (+12.2%)
Profit: not available
Margin: not available
diehl.com

**54
AEROJET ROCKETDYNE**

Revenue: \$1.60 billion (+15.5%)
Profit: \$13.2 million (-40.8%)
Margin: 0.8%
rocket.com

+2

**60
DAHER**

Revenue: \$1.29 billion (+1.0%)
Profit: not available
Margin: not available
daher.com/cms/aerospace

-1

**55
HEXCEL**

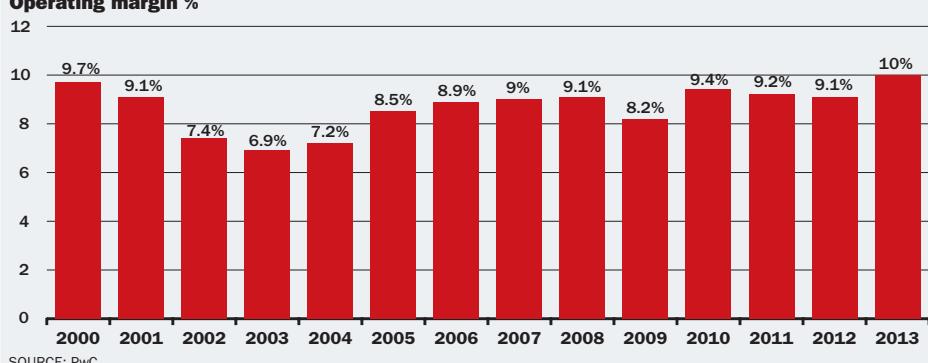
Revenue: \$1.59 billion (+8.9%)
Profit: not available
Margin: not available
hexcel.com

**61
PILATUS**

Revenue: \$1.28 billion (+15.8%)
Profit: \$218.5 million (+37.9%)
Margin: 17.0%
pilatus-aircraft.com

AVERAGE TOP 100 OPERATING MARGIN 2000-2013

Operating margin %



SOURCE: PwC

Rolls-Royce feels the heat

TOP 100 SPECIAL REPORT

62 RUAG

Revenue: \$1.14 billion (+3.7%)
Profit: \$67.7 million (+24.0%)
Margin: 6.0%
ruag.com

63 HEICO

Revenue: \$1.13 billion (+12.2%)
Profit: \$203.4 million (+10.8%)
Margin: 18.0%
heico.com

64 CYTEC

Revenue: \$1.10 billion (+5.7%)
Profit: not available
Margin: not available
cytec.com

65 WOODWARD

Revenue: \$1.08 billion (+2.1%)
Profit: \$159.2 million (-4.2%)
Margin: 14.7%
woodward.com

66 LISI

Revenue: \$1.05 billion (+18.7%)
Profit: \$147.5 million (-1.2%)
Margin: 14.1%
lisi-aerospace.com

67 FOKKER TECHNOLOGIES

Revenue: \$1.01 billion (-0.6%)
Profit: \$30.6 million (-16.1%)
Margin: 3.0%
fokker.com

68 TURKISH AEROSPACE

Revenue: \$1.0 billion (+9.5%)
Profit: not available
Margin: not available
tai.com.tr/en

69 BALL AEROSPACE

Revenue: \$935 million (+4.2%)
Profit: \$79.7 million (-0.3%)
Margin: 8.5%
ballaerospace.com

70 AMPHENOL

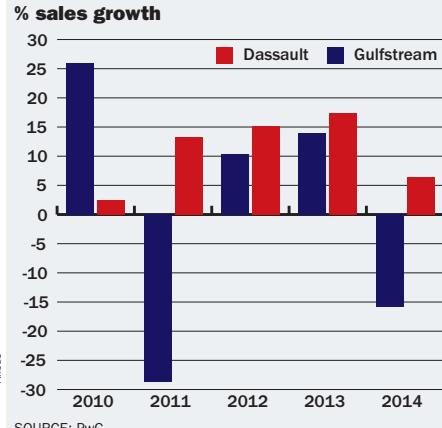
Revenue: \$917 million (+10.5%)
Profit: not available
Margin: not available
amphenol.com

CIVIL

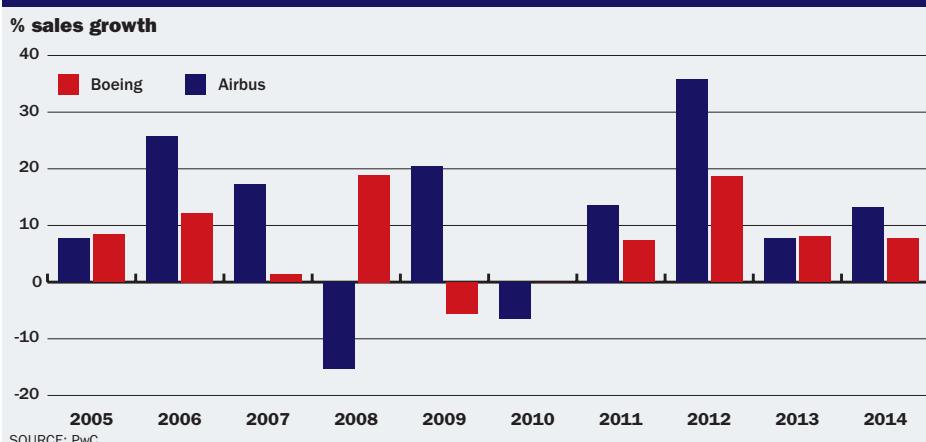
The civil aviation boom continues to look like an economic super-cycle, with aircraft demand and deliveries rising strongly over a decade and some recent good news in the business jet, regionals and turboprops sectors. Be alert, though, for disruption; post-crisis recovery was always weak, and emerging markets underpinning aerospace growth – China and Asia, India, Brazil – are faltering. Directly impacting aircraft fleet planning is the collapse of oil prices, which may stay low for a long time. Meanwhile, Airbus is moving onto Boeing's turf with an A320 plant in Mobile, Alabama, and Canada's Bombardier is struggling with the cost of its CSeries programme.



BUSINESS AIRCRAFT SALES GROWTH 2010-2014



LARGE CIVIL AIRCRAFT SALES GROWTH 2005-2014



12%

CSeries costs may be hammering Bombardier, but sales are rising nicely

71
CONSTELLIUM

Revenue: \$885 million (+1.8%)
Profit: not available
Margin: not available
constellium.com

74
ITP

Revenue: \$863 million (+3.7%)
Profit: not available
Margin: not available
itp.es

77
CURTISS-WRIGHT

Revenue: \$714 million (+7.9%)
Profit: not available
Margin: not available
curtisswright.com

72
SENIOR

Revenue: \$884 million (+6.0%)
Profit: not available
Margin: not available
seniorplc.com

75
MAGELLAN AEROSPACE

Revenue: \$761 million (+12.1%)
Profit: \$77.8 million (+24.4%)
Margin: 10.2%
magellan.aero

78
FACC

Revenue: \$702 million (-3.4%)
Loss: \$6.0 million (**2013 profit: \$55.7m**)
Margin: -0.9%
facc.com

73
LATECOERE

Revenue: \$881 million (+6.9%)
Profit: \$49.5 million (**2013 loss: \$53.9m**)
Margin: 5.6%
latecoere.fr

76
AERNNOVA

Revenue: \$734 million (+0.5%)
Profit: \$52.4 million (not available)
Margin: 7.1%
aernnova.com

79
CRANE AEROSPACE

Revenue: \$696 million (+0.3%)
Profit: \$138.2 million (-13.6%)
Margin: 19.9%
craneae.com

REGIONAL AIRCRAFT SALES GROWTH 2010-2014



16%

Dassault Aviation's Falcon division took a fall on the business jet rollercoaster

CIVIL AIRCRAFT SALES 2014*

	\$ million
1 Boeing	59,990
2 Airbus	55,110
3 Rolls-Royce	11,258
4 Bombardier	10,499
5 Gulfstream**	8,649
6 Honeywell	7,185
7 Precision Castparts	6,303
8 Cessna/Beechcraft***	6,182

NOTE: *local currency **General Dynamics ***Textron Aviation
SOURCE: PwC

CIVIL AIRCRAFT SALES GROWTH

	2014 v 2013
1 Fokker Technologies	61.9%
2 Cessna/Beechcraft*	34.9%
3 TransDigm	23.3%
4 Amphenol	20.5%
5 Heico	16.4%
6 Aerojet Rocketdyne	15.5%
7 Ducommun	14.6%
8 Boeing	13.2%

NOTE: *Textron Aviation SOURCE: PwC

TOP 100

SPECIAL REPORT

80	KONGSBERG	-5
<i>Revenue: \$678 million (-6.1%)</i> <i>Profit: \$65.7 million (+9.5%)</i> <i>Margin: 9.7%</i> kongsberg.com/en/kds		
81	CHEMRING	-5
<i>Revenue: \$664 million (-14.7%)</i> <i>Profit: \$41.8 million (2013 loss: \$73.0m)</i> <i>Margin: 6.3%</i> chemring.co.uk		
82	INDRA	+1
<i>Revenue: \$663 million (+4.2%)</i> <i>Profit: not available</i> <i>Margin: not available</i> indracompany.com		
83	ULTRA ELECTRONICS	-1
<i>Revenue: \$658 million (-4.2%)</i> <i>Profit: not available</i> <i>Margin: not available</i> ultra-electronics.com		
84	JAMCO	+3
<i>Revenue: \$643 million (+19.9%)</i> <i>Profit: \$71.6 million (+87.5%)</i> <i>Margin: 11.1%</i> jamco.co.jp/e		
85	KAMAN AEROSPACE	-1
<i>Revenue: \$633 million (+3.1%)</i> <i>Profit: \$108.7 million (+6.0%)</i> <i>Margin: 17.2%</i> kaman.com/aerospace		
86	SKF	
<i>Revenue: \$621 million (+11.6%)</i> <i>Profit: not available</i> <i>Margin: not available</i> skf.com		
87	DUCOMMUN	-2
<i>Revenue: \$608 million (-0.5%)</i> <i>Profit: not available</i> <i>Margin: not available</i> ducommun.com		



93	GARMIN	+2
<i>Revenue: \$386 million (+13.9%)</i> <i>Profit: \$107.0 million (+21.6%)</i> <i>Margin: 27.7%</i> garmin.com/en-US/explore/intheair		

94	PRAXAIR	-1
<i>Revenue: \$368 million (+2.9%)</i> <i>Profit: not available</i> <i>Margin: not available</i> praxair.com		

95	HEROUX-DEVTEK	+4
<i>Revenue: \$331 million (+34.2%)</i> <i>Profit: \$5.94 million (-58.0%)</i> <i>Margin: 1.8%</i> herouxdevtek.com		

96	MARTIN-BAKER	+1
<i>Revenue: \$326 million (+2.1%)</i> <i>Profit: \$87.3 million (+26.2%)</i> <i>Margin: 26.8%</i> martin-baker.com		

97	ELETTRONICA	-3
<i>Revenue: \$319 million (-6.5%)</i> <i>Profit: \$36.4 million (+6.2%)</i> <i>Margin: 11.4%</i> elt-roma.com		

98	DONCASTERS	-2
<i>Revenue: \$293 million (-11.6%)</i> <i>Profit: not available</i> <i>Margin: not available</i> doncasters.com		

99	FIGEAC AERO	+1
<i>Revenue: \$271 million (+25.6%)</i> <i>Profit: \$40.5 million (+37.1%)</i> <i>Margin: 15.0%</i> figeac-aero.com		

100	FLIR SYSTEMS	-2
<i>Revenue: \$271 million (-7.3%)</i> <i>Profit: not available</i> <i>Margin: not available</i> flir.com		

TOP 100 BY COMPANY NAME

	Ranking		Ranking		Ranking
Aernnova	76	FLIR Systems	100	Meggitt	44
Aerojet Rocketdyne	54	Fokker Technologies	67	Mitsubishi	19
Airbus	2	Fuji Heavy Industries	58	Moog	51
Alcoa	23	Garmin	93	MTU Aero Engines	25
Allegheny Technologies	57	General Dynamics	14	Northrop Grumman	6
Amphenol	70	General Electric	5	Orbital ATK	35
Asco	89	GKN Aerospace	32	Parker Hannifin	42
AVIC	28	Griffon-Aerospace	90	Pilatus	61
BAE Systems	11	Harris	33	Praxair	94
Ball Aerospace	69	Heico	63	Precision Castparts	18
B/E Aerospace	37	Heroux-Devtek	95	Raytheon	7
Boeing	1	Hexcel	55	Rockwell Collins	26
Bombardier	13	Hindustan Aeronautics	36	Rolls-Royce	10
CAE	46	Honeywell	12	RUAG	62
Chemring	81	IHI	29	Saab	48
Cobham	39	Indra	82	Safran	8
Constellium	71	Irkut	50	Senior	72
Crane	79	Israel Aerospace Industries	31	SKF	86
Curtiss-Wright	77	ITP	74	Sonaca	91
Cytec	64	JAMCO	84	Spirit AeroSystems	20
Daher	60	Kaman Aerospace	85	ST Engineering	53
Dassault Aviation	27	Kawasaki	34	Telodyne Technologies	40
Diehl Aerosystems	59	Kongsberg	80	Textron	16
Doncasters	98	Korea Aerospace Industries	43	Thales	21
Ducommun	87	L-3 Communications	15	TransDigm	41
Eaton	47	Latecoere	73	Triumph Group	30
Elbit Systems	38	Liebherr	56	Turkish Aerospace Industries	68
Elettronica	97	LISI	66	Ultra Electronics	83
Embraer	22	LMI Aerospace	92	United Aircraft	17
Esterline	52	Lockheed Martin	3	United Technologies	4
Exelis	49	Magellan Aerospace	75	Woodward	65
FACC	78	Marshall	88	Zodiac	24
Figeac Aero	99	Martin-Baker	96	SOURCE: PwC	
Finmeccanica	9	MDA	45		

DATA SOURCE

The Flight International Aerospace Top 100 was compiled by aerospace experts at PricewaterhouseCoopers ("PwC"). The information used in preparing this report has been obtained solely from company annual reports, public filings and other publicly available information. PwC has not sought to establish the reliability of this information and has not verified such information. Accordingly, no representation or warranty (whether express or implied) is given by PwC as to the accuracy of this information.

COMPANY/DIVISIONS

The top line of the financial figures refers to consolidated results for the overall group, including non-aerospace businesses. The divisional figures are

for those businesses that are fully or largely concerned with aerospace. Groups have been ranked by their aerospace sales in financial year ending 2014/2015, calculated from those divisions that operate primarily in the industry. Sectors involved with aircraft, aeroengines, avionics, missiles, space and aerostructures are largely straightforward, but telecommunications, network-centric and C4I systems and some overhaul operations are included only where these are largely concerned with aerospace activities. Satellite services have been excluded wherever possible, as have companies and divisions that derive more than 50% of their revenues from services such as leasing. Where acquisitions were made within

the accounting period, pro-forma accounts have been used for the 12-month consolidated performance.

Joint ventures have been included in the financials. Intersegment sales have been excluded from operating results and profits for divisions where possible. When not possible, divisional results have been presented inclusive of inter-division sales, resulting in aerospace revenues greater than group sales.

EXCHANGE RATES

An average exchange rate for the period 1 January 2014 to 31 December 2014 has been used for all non-US companies, regardless of fiscal year definitions. The percentage changes in financial figures are given in local currency terms to avoid unnecessary distortions.

COUNTRY

Companies have been listed by country of headquarters or incorporation.

OPERATING RESULTS

Generally, the profit (or loss) is before interest, tax and exceptional items and after deduction of depreciation. The measure is a generally accepted guide to a business's operational performance. Discontinued or discontinuing operations are included where they fall in fiscal year 2013 for that business.

ROCE

Return on Capital Employed (ROCE) is calculated as earnings before interest, expense, taxes, unusual items and minority interests divided by year-end total assets less year-end non-interest bearing current liabilities.

PROJECT MANAGEMENT PWC DAVID VAN OSS

HOW TO KEEP MAJOR CAPITAL PROGRAMMES ON TRACK

IN LATE June, Network Rail – the authority responsible for the UK's railway network – announced it would be unable to deliver all planned network improvements. It added that the £38.5 billion (\$59.2 billion) upgrade plan, launched in 2014 as the “largest modernisation of the railways since Victorian times”, was too ambitious.

There followed a media fire-storm. Network Rail's management got a kicking from the press. But I feel Network Rail was more “sinned against than sinning”.

Why? Well, one aspect the coverage conveniently overlooked was the enormous complexity of delivering major infrastructure programmes – in this case under the full glare of public and political scrutiny – while running a railway network. Throw in the need to overlay infrastructure dating back to the Victorian age with modern electrification, and it's not a job many would envy. The team ran into problems. Is that surprising?

But there's a deeper point. Look back to the start of the 2010 parliament and recall one of the new coalition government's proudest

achievements was to eliminate the Ministry of Defence's “bow wave” list of unfunded programme commitments. No bow wave meant budgets were in place for the things the MoD had committed to buy.

Applying the same principle to Network Rail and the Department for Transport begs the question: what's worse? Plans being put in place, and even effect, without resources and budgets? Or someone calling for a reset, so the expectations of everyone involved – passengers, taxpayers, the supply chain, train operators, parliamentarians – are actually aligned with the reality of what can be delivered?

A LAUDABLE DELAY

So, while the announcement of delays to the improvement plans made for painful reading, you could argue it was a laudably responsible act, both by the DfT as the sponsor and Network Rail as the delivery body. It was the right thing to do in the circumstances – and avoided far worse problems down the line.

Whatever the specific rights and wrongs, the whole episode provides a salutary reminder that delivering

complex programmes requires not just sufficient budgets and technical capabilities, but also a whole swathe of programme management skills – together with reliable information. Only by combining all these components can a delivery organisation make the right decisions, manage its risks effectively, and deliver what it has promised.

Leaders making the right decisions stand on two key pillars: trust and control

Achieving this boils down to two interrelated attributes: trust and control. In my view, any major programme – whether tangible, like transport infrastructure, or intangible, such as a bank's compliance systems – will fail without both of these two pillars in place.

Let's look at trust first. Building trust in a programme is about having the courage to be honest about what can be delivered and when. Sometimes this means disappointing expectations and taking flak –

but it's the kind of transparency and openness we expect from people in leadership positions.

CONFIDENCE IS REQUIRED

You can't build trust in a large, complex programme without control. And this requires clear oversight of – and confidence in – the people responsible for delivery and the underlying facts, founded on comprehensive, trustworthy and integrated information. Only with such information can programme leaders take the right decisions.

However, this is an area where problems often arise. Not unlike our transport systems, much of the decision-making infrastructure used to run UK programmes is a legacy of the past. The result is project information that may be poorly integrated, fragmented and even partial – which in practice can be the same as unreliable.

What's needed is a solution that provides programme managers with information that's both accurate and integrated, enabling decision-making that takes account not just of individual facts but also of the interdependencies between them. And given the sheer number of workstreams and interrelations in today's major programmes, it's important that the solution takes a portfolio approach to projects, blending a high-level view with insight at the individual project level.

There is, though, a wider point here, as the successful delivery of any major programme in any business comes down to managing three critical dimensions: cost, risk and time. We have developed an approach called Mission Control to help our clients deliver major programme successes, in industries ranging from public infrastructure to financial services. We believe it's the future of complex programme management, which any organisation could benefit from. ■

For more information contact PwC consulting partner David Van Oss:
david.van.oss@uk.pwc.com

 Read more on aerospace industry strategy at flightglobal.com/PwCa&d



FLIGHT INTERNATIONAL

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Or email flight.international@flightglobal.com

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Flying in the face of technology basics

In your article "Speed data error led to 767 tail-strike at Madrid" (*Flight International* 1-7 September), you describe another accident caused by data entry errors.

Those of us who started our airline careers in clockwork cockpits, before the introduction of screens and management systems, learned to 'guesstimate' our aircraft weight for each departure before going into the performance manual to obtain the speeds to be 'bugged up' on the ASI for take-off.

Even with the introduction of flight management systems (FMS) and cathode ray tube displays in the early 1980s, by habit most pilots continued to carry out these 'gross error' checks.

Now that we have high technology in our everyday lives, we have a generation who seem to put implicit faith in what's on the screen. Pilots must get back to the gross error habit of yesterday and here's how to do it.

By mental arithmetic or written sum on the back of the flight log (or if you must, an electronic

ACCIDENT Did Hunter pilot attempt landing?

In your cover article (*Flight International*, 1-7 September), you say the pilot of the Hunter "failed to complete a pull up", which I find rather spartan.

As a witness to the crash, standing on the eastern edge of the apron and in line with the start of the Kilo taxiway, I saw the Hunter pull up from the loop at around 500ft on or parallel to the runway 20 extended centre line.

The aeroplane at this point appeared to be either experiencing turbulence and/or there was a control issue (Hunter jack stall?), as the airframe was juddering in the pitch plane and then dropped the left wing into the crosswind. The pilot then put the nose down and the aeroplane disappeared behind some trees on the approach.

Apart from the short period of airframe juddering, the pilot seemed to be in control. The air temperature was 25°C and humidity felt high, impacting the density altitude. There was a strong easterly crosswind off the river estuary, which can cause turbulence. The coastal effect can also result in varying wind directions, including tailwinds.

The Hunter's flaps were also down, which would cause unexpected pitch change if uncommanded.

From where I stood, the pilot appeared to dive the aeroplane towards the airfield, presumably to attempt a landing.

John Woodhouse
Hove, East Sussex, UK



The aftermath at Shoreham

Airlines may not like the idea due to weight, drag and complexity, but it is surely better than the alternative.

Peter Gambardella
Farnborough, Hampshire, UK

Shifting views on flying displays

In your issue of 17-23 April 2012 [following a US National Transportation Safety Board report into a P-51D Mustang crash in Reno, Nevada, which killed 11 spectators], your question of the week was about air show flying displays.

With the Hawker Hunter crash at Shoreham in mind, I wonder whether the percentage of the replies would be different if you repeated it now?

J McDermott
Hereford, UK
Editor's reply: Following the US accident, 76% of respondents said that current regulations worked well, 20% believed that shows needed to be made safer and 4% voted for a ban. In our post-Shoreham poll (*Flight International*, 8-14 September), 70% of voters said shows are fundamentally safe, 16% called for a ban and 14% said big changes are needed.

Past insight

During 45 years in the aircraft industry and having watched dozens of Hunters loop, I have never seen it done with the flaps down, but the films and photos of the aircraft before the tragic accident at Shoreham clearly show them to be so.

That has to be relevant, but I have not heard a single interviewed expert or pundit mention it. I trust the Air Accidents Investigation Branch has noticed.

John Mattocks
via email

calculator), add together the basic weight of the aircraft, fuel and payload to come up with an expected take-off weight. Compare that weight with what's entered in the FMS.

This calculation, if using an Airbus A320 for illustration, can be done easily, even before arriving at the aircraft.

Basic weight 42,000kg, fuel 6,000kg, payload 15,000kg (150 passengers plus baggage)
 $42+6+15=63$. So we expect a take-off weight of 63,000kg.

This procedure, just once in a 40-year career, saved me from being involved in an incident.

Colin Starkey
Bath, Somerset, UK

Limiting damage

Following yet another tail-strike (*Flight International*, 1-7 September), is it now time for the certification authorities to require a form of protection to prevent such damage to the fuselage occurring in future?

The Aeromexico incident resulted in damage to the pressure hull which could have led to a catastrophic failure if the aircraft had reached cruise altitude, similar to the damage caused to the Boeing 747 in Japan when a poorly executed post-tail-scrape repair failed.

Such devices already exist, as they are used during the minimum unstuck trials.

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Maiden ops for Bruce's Boeing

There will be no mistaking the first 737-400 to go into service with ACMI airline Cardiff Aviation. Its callsign – Maiden-001 – is a reference to company chairman, commercial pilot and Iron Maiden vocalist Bruce Dickinson.

Diverse operations so far include revenue flights for Iraqi Airways and transporting diehard Maiden fans to an album listening party.

A Tikrit to ride, perhaps.

A step Baku

Political correctness clearly has bypassed Baku, judging by an advertisement for cabin crew by Azerbaijan's flag-carrier, extracts from which we quote:

"To the attention of females, willing to work as flight attendants in CJSC Azerbaijan Airlines (AZAL).

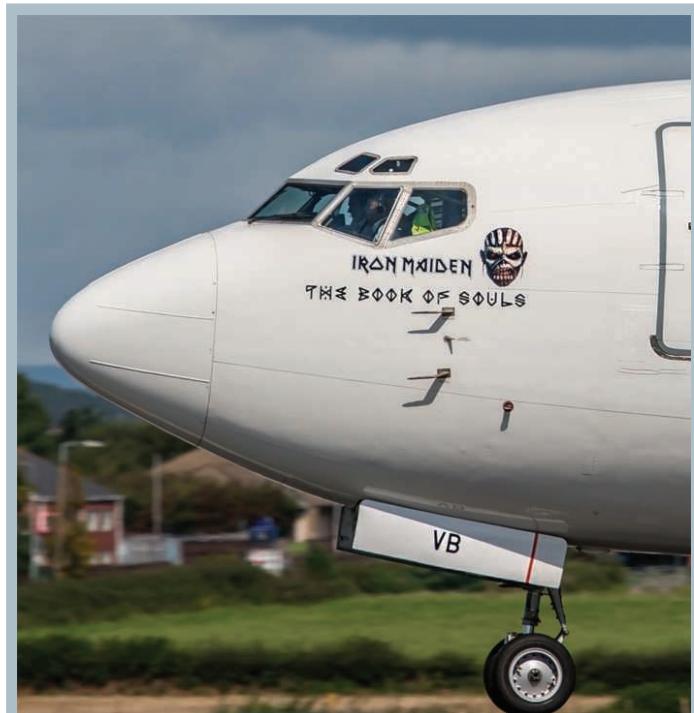
"AZAL has announced the admission of documents from females for a flight attendant's position... The candidates will be selected by a competition... open only to good-looking girls aged 18-30..."

Shuttleworth a mention

Tom Sheppard sends in this poignant snap, which he says sums up what is best about the Shuttleworth Collection aviation museum near Bedford.



"So, Hoskins jnr, this is what led to scimitar blades on the XWB fan..."



"Did anyone remember to take the sticker off?"

The photograph reminds him, he says, of those advertisements for expensive Swiss watches – you never actually get to own one of the pricey timepieces; you just get to look after it for the next generation.

"Shuttleworth is an exceptional collection of aircraft, not only for what they are but for the manner and surroundings in which they are displayed," he remarks.

"Each machine looks as if it left the factory that morning."

Sheppard adds: "The collection has no shortage of

visitors but deserves all the praise and PR it can get." We are delighted to oblige.

Head start

Following the Cecil the lion scandal, Qatar Airways is the latest airline to ban carriage of hunting trophies covered by the CITES endangered species convention.

An exception presumably is one particular extremely rare animal whose head is transported on every Qatar aircraft – the Arabian Oryx resplendent on the tail.

Parent power

Given the increasing tendency for airframers to agree single-source supply agreements with engine manufacturers, one potential scenario is that Boeing's so-called Middle of the Market replacement for the 757 could end up with an exclusive US propulsion source: Pratt-only Power, if you will.

"It would be a nice return to family values," suggests our correspondent, "with such a MoM and PoP set up."

Intoxicated Empire

It is my conviction that the struggle in which we are now engaged will be the best possible thing for Britons. A few more decades of peace and we would have become intoxicated with self-aggrandisement and power while the Empire toppled about our ears.

Pans into planes

The appeal to the housewives of Britain to yield up their pots

75 YEARS AGO

and pans was responded to nobly. From rather forlorn-looking utensils, battered by their journeying from the collecting centres of the W.V.S., they became shining ingots of aluminium of high purity.

Way off course

NASA's Nimbus 1 weather satellite, which took some

50 YEARS AGO

27,000 pictures before it ceased to operate in September, has provided information which is making major changes to maps. The position of Mount Siple, a 10,000ft mountain in Antarctica used by pilots as a navigational aid, has been found to be 45 miles west of that shown on present maps.

Glad of glasnost

The RAF chief indicates that Sukhoi's test pilot would be

25 YEARS AGO

allowed to fly the Tornado, Harrier or "anything he wants". He cites his flight in the Su-27 as "a real example of glasnost. Two years ago it could never have happened – we must ensure that the process continues."

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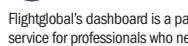
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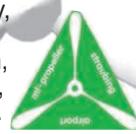
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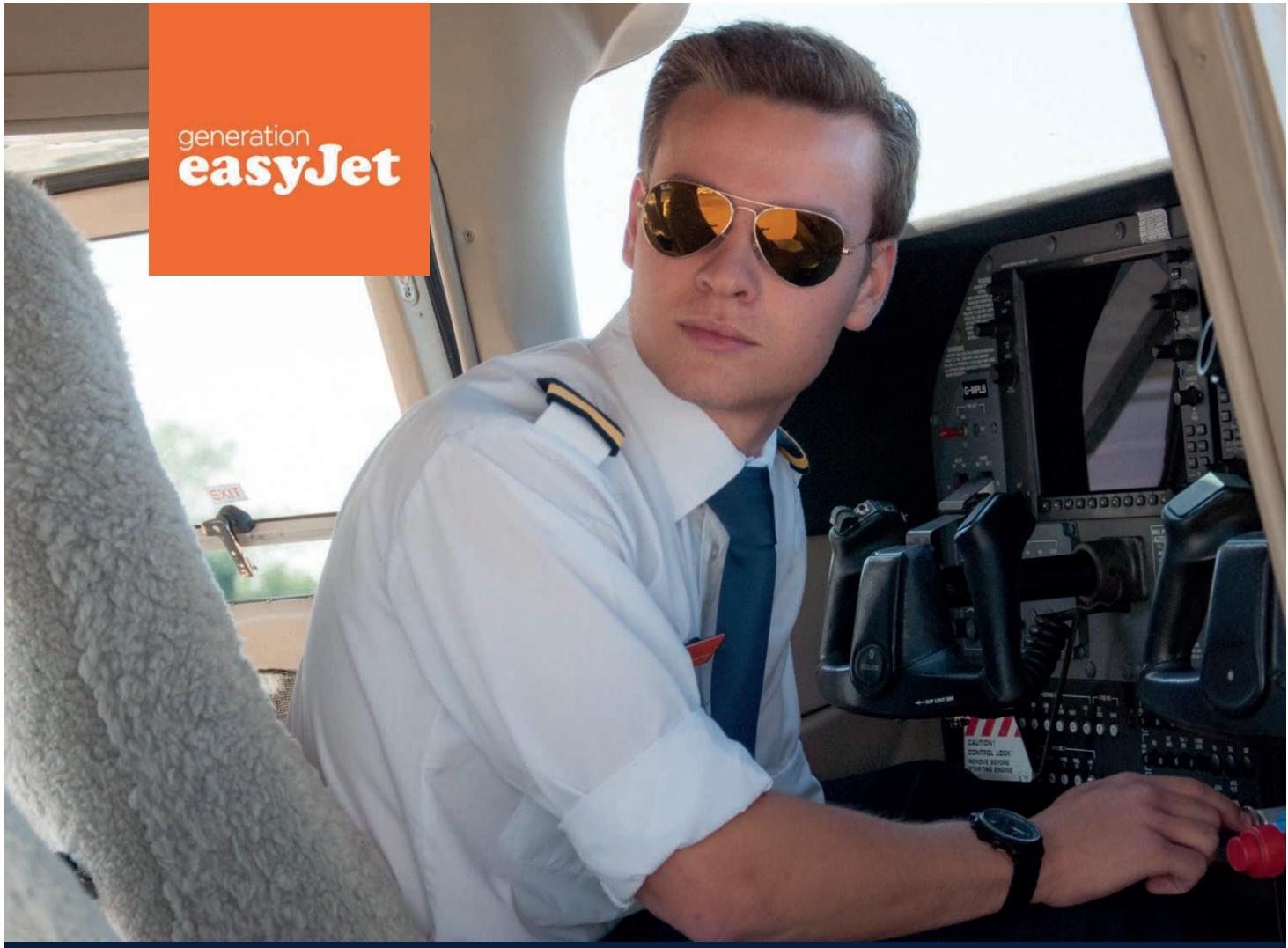
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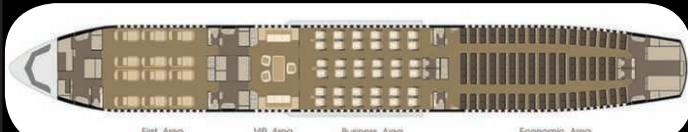
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WORK EXPERIENCE ANDY WEST

Catering to presidents and pets

Charter sales executive with Acropolis Aviation has the aviation industry in his blood, moving from his first job at the Farnborough air show to his current post with the VVIP operator where he looks after high-end clients

How did you get into aviation?

It has always been in my blood, with most of my family working in aircraft engineering or flight operations. My father was an aircraft engineer for 30 years with Cathay Pacific in Europe and Hong Kong before training on the Bombardier fleet with TAG Aviation, and my cousin is a flight dispatcher for Japan Airlines.

My first aviation job after college was at the 2008 Farnborough air show working with TAG Farnborough airport on the VIP side. Once the air show ended, I moved to Heathrow airport for three years, working at the Royal Suite co-ordinating royal and diplomatic movements, handling anything from a Cessna Citation Excel to a government delegation fleet of Boeing 747-400s.

The craziest period was during the 2009 G20 summit in the UK. I handled four Boeing 747-400s, a 757, an MD-11, five Airbus A319s and an Embraer Lineage 1000, all in 3h. Then I was fortunate enough to get back to Farnborough and started with VIP charter airline Acropolis in 2011, first in flight operations and then onto charter sales.

What is your current role?

I manage all aspects of charter flights from the sale to trip scheduling, flight watch and client post-flight follow-up.

I am the central point of information and connect the client to the operation, managing the flow of information across departments, which is crucial for a suc-



Acropolis Aviation

West offers clients a personalised service and a flexible approach

cessful flight. We fly the ACJ319 so we mainly handle long-haul flights – it can be a private party for 19 guests, a financial roadshow, or a head of state or government visit. I also plan and attend company marketing events, which are a lot of fun. Our aircraft has been shown at all the major air shows and next on our agenda is the Dubai air show and NBAA in Las Vegas.

Tell us about the market sector you are serving – what do customers demand?

We serve different clientele, including private family use, governments and corporate users.

While a proportion of the market is consolidating or expanding fleet sizes by acquisition, the ACJ/BBJ market is very niche and at Acropolis we pride our-

selves on a tailored approach to that small market.

There is a lot of consolidation in Europe currently, which can be confusing for aircraft owners who find themselves dealing with a whole new set of people.

As we focus on the one aircraft, we guarantee clients an accurate response to enquiries, a personalised on-board service and a flexible approach. This helps us deliver the ultimate experience on a large-cabin aircraft.

What is a typical working week?

Whether it be through a charter broker, where 95% of our business comes from, or a direct client, once we have the sale, I need to ensure we deliver on the client's expectations.

I need to guarantee a memorable flight, so my priority is to re-

main attentive to the client's needs and deliver a memorable on-board experience. For example, a recent client was concerned about their dogs flying, so I arranged for astro-turf in a section of the cabin!

Acropolis has just launched the new ACJ320neo – how are you prepared for that?

We had a significant presence at the European Business Aviation Convention and Exhibition in May, when Acropolis confirmed it would be the first customer for the new ACJ320neo.

Now we have a busy period determining how the next aircraft will look. Our goal is to announce the cabin designer at NBAA.

Our open-plan Alberto Pinto cabin has proved popular and we need to evolve that design to stay market leader.

The new aircraft will have 15% more cabin space, so we need to look at what works well and what we could introduce.

From a technical view, the commonality our ACJ319 shares with the future ACJ320neo helps mitigate risks when operating a new type. ■

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